

FEBRUARY 20, 1956 50 Cents

AVIATION WEEK

A MCGRAW-HILL
PUBLICATION



Chance Vought Regulus
Learns to Live at Sea

Japanese Industry
Arrives at Jet Age

First in Constant Speed Drives...



New electrical concept in F-102A attributed to Sundstrand Constant Speed Drives

The advanced Air Force F-102A all-weather supersonic interceptor, built by Convair, incorporates the new concept in electrical systems. Here, due to the Sundstrand Constant Speed Drive, is an automatic constant frequency ac system providing plenty of stable power, with heavy overload capacity under all flight conditions. Here is reliable power for optimum operation of electronic devices which make the F-102A a modern, rugged, all-weather weapon. And here is another example of how the new concept in electrical systems... known by Sundstrand's Constant Speed Drive... meets the challenge of today's... and tomorrow's... fast, high flying aircraft. Can we help you?



New Electrical Horizons...

One opening to design engineers, through co-operation between engine and airplane manufacturers and Sundstrand. With this new concept in electrical systems, expect remarkable advances in operation and performance of tomorrow's aircraft.

SUNDSTRAND AVIATION

Divisions of Sundstrand Machine Tool Company, ROCKFORD, ILLINOIS Western District Office, Hawthorne, California
CONSTANT SPEED DRIVES • AIRCRAFT ACCESSORIES

**WHY
DOES AN ATHLETE
"WARM UP"?**



**—the answer is the key to
the peak performance of Goodyear Airplane Tires**

The purpose of an athlete's "warm up" is obviously vital to be in "loose" or "looser up" his muscles. Actually the reverse is true. Through this exercise he is really tightening his muscles—loosening them up and getting them ready to deliver top performance.

In this lies the key to the top performance of the High-Temperature 3-T Nylon Cord built into Goodyear Airplane Tires.

For this specially processed Nylon is an organic fiber—and so each reacts very much like human skin and muscle. You might say it has a "memory"—when subjected to tension and strain, it tends to resist change.

So, Goodyear's multi-million-dollar processing equipment preconditions and sets the 3-T Nylon Cords under heat. It then has what engineers term "a negative coefficient of expansion"—it tends to contract, or tighten up, when it encounters the heat and strain of this service.

This makes 3-T Nylon ideal for high-speed, high-impact airplane tires. It has the strength to fight back. It tends to control tire growth in service.

As a result of these qualities, obtained by the patented 3-T processing, Goodyear Airplane Tires—both radial and tube type—have achieved a spectacular record of outstanding performance on today's high-speed aircraft.

Goodyear, Aviation Products Division,
Akron 16, Ohio, and Los Angeles 54, California.



FACILITIES + ABILITIES = EXTRA *mile* IN PERFORMANCE

another reason why **RYAN BUILDS BETTER**



HERE ARE 44 OF AVIATION'S MOST PRODUCTIVE ACRES

Ryan is a \$30 million facility, superbly equipped for its job of serving the aircraft and engine industries and the military services. With 500,000 square feet of factory floor space, Ryan manufacturing includes "big" jobs like the huge Boeing KC-135 mid and aft fuselages and Douglas DC-8 jet engine pods and pylons. With the most modern machine tools for turning, welding, machining and heat treating, Ryan manufactures the exacting jet engine, afterburner, rocket and rocket components which require surgeon-like skills and intimate knowledge of high temperature alloys.

Ryan is 4750 people, headed by a management that has demonstrated experience and vigor in achieving top performance in quality, delivery and low costs. Ryan's financial stability and

sound growth are widely recognized. Ryan's skilled production people are specialists who draw upon a background that covers 25 years of the half-century of flight. There is no parallel to the Ryan combination of experience, facilities and proven performance in its field.

Ryan is a leader in research and development, which believes in "never letting well enough alone." One out of every ten employees is in the engineering division. By enlightened attack upon aviation's complex problems, Ryan engineers are continually advancing the state of the art. Significant milestones in this steady program are Ryan's all-jet vtro airplane, the world's first, the Finkeo jet target drone and Ryan's unique electronic system for automatic, global navigation and for missile guidance.

With a background of 25 years of experience in aviation, Ryan stands in designing and producing high quality aircraft, power plants and missiles, built at low cost, delivered on time.

Deposits totaling \$100 million will fund outstanding operations at Ryan.

RYAN
AERONAUTICAL COMPANY
AN IRVING-CLOUD COMPANY

A Reaction Motor 2,000 YEARS AGO...



AND NOW

Here was a city boy from Alexandria (Egypt) who was always *ground-lengths* ahead of his class when it came to things mechanical. Tinkering around one day in the year 120 B.C. he came up with a gadget that would revolve indefinitely as long as he kept a brisk fire under it. Called the "Aeolipile," this device was a primitive reaction motor. But alas, Hero's engine ended up as a mere curiosity — for lack of an application.

Today, the changing new requirements are constantly creating the need for power sources which only rocket engines—modern reaction motors—can satisfy. RMI engineers have successfully harnessed this reaction principle for a wide variety of important airframe propulsion requirements and are extending the application of rocket power to other equally important fields.

◀ Still testing a new RMI rocket engine of the most advanced design.



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Danville, New Jersey
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CONTOUR-WELD



new stainless pipe

with a weld so smooth you can't even feel it

Run your finger over the weld area inside Trent's new Contour-Welded® pipe. We doubt if you can even feel the weld. It's that smooth! There's no weld bead . . . no undercut . . . no place for corrosion or erosion to get a start.

Here's the reason: Contour-Welding is an entirely different method of producing welded pipe and tubing. It puts gravity to work to pull down the molten weld-metal to conform with the exact contour of the pipe. That means a smooth, clean weld practically indistinguishable from the pipe itself!

Contour-Weld Means Trent's Better Than Ever

As always, this new TRENTWELD pipe and tubing is made from uniformly rolled stainless strip. Wall thickness is always the

same throughout the pipe . . . and Contour-Welding brings this same high uniformity to the weld area itself! All this, plus Trent's superior cold-working methods, gives you a stronger pipe or tube, with smoother flanged or flared ends.

Try new TRENTWELD pipe or tubing on your next job. It's available in any size, for all applications including high-pressure hydraulic lines . . . high-velocity systems . . . lines carrying corrosive chemicals. And new Contour-Welded tubing is available in most grades, including Hastelloy, Zirconium, Inconel, Titanium and 19-9-DM. You'll find that TRENTWELD can't be beat by any other pipe—welded or not.

*Contour Weld is the trade mark of the Trent Tube Company for its process of making pipe and tubing, which is protected under U.S. Patent 2,778,892.

CONTOUR-WELD PIPE...BEST BY ANY TEST YOU CAN NAME



Flare and Flange



Pressure Flanging



Flattening



Severe Bend (1/4" O.D. x 1/2 Wall)



Uniformity

Why Trent's Exclusive Contour-Weld Process Means Smoother Welds . . .



Normally, in producing welded pipe, the weld is made at the top. But gravity plays a nasty trick. It rips at the fluid metal in the weld area, pulling it down toward the middle of the pipe. The result, particularly in the heavier grades, is a pesky bulge where it hurts the most—right on the ID surface. If you try to get rid of the bulge—at fit cost—the metal is undercut—and corrosion and erosion start there.



But Trent put a stop to that—simply by going into partnership with gravity. With their exclusive Contour-Welding process, they weld at the bottom—and gravity works for them. For then, the bulge is in the opposite direction—blending in perfectly with the contour of the pipe track.

TRENTWELD

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Most Magnetic Amplifier Voltage Regulators
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Regardless of the plane or the mission, rugged dependability means everything beyond the point of no return.

Cline Electric supplies new assurance of safe arrival! The Cline Regulator, wide-frequency-range (350-1000 cycles) Magnetic Amplifier Exciter Voltage Regulator, with the USAF B-1 alternator, now in widespread use on the T-28, C-97, and C-119, has logged more hours of dependable flying time than any other military aircraft voltage regulator.

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CLINE ELECTRIC MANUFACTURING COMPANY
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254

MINUTES INSTEAD OF HOURS

▲ Engine heat-up time—external ground equipment—6 hours

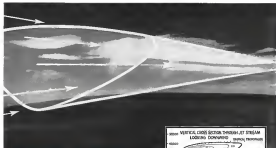
MINUTES INSTEAD OF HOURS

▲ Engine heat-up time—BAP and weather oil system—30 minutes

UNITED AIRCRAFT PRODUCTS, INC.
1116 BOLANDER AVENUE, DAYTON, OHIO



These weather items prepared in consultation with the United States Weather Bureau

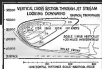


JET AGE DEVELOPMENTS

JET FLIGHT — As jet flight becomes more commonplace, it's increasingly important to understand and anticipate the problems and glaciaceous areas and with high altitude, high-speed travel. Clear ice turbulence, sudden wind and temperature changes, subsiding air are some of the meteorological features now being explained.

JET STREAM — A recently discovered current of high-speed winds moves from the West across the middle latitudes of both hemispheres. Maximum wind velocities of over 200 knots are reached at altitudes of 35,000 to 50,000 ft., varying as much as 75 knots per 1,000 ft. up to the core. Cross-sectional view at upper right best shows jet stream structure.

JET FUELS — To meet the critical demands of subsonic flight, jet fuels must also act as cooling agents. New manufacturing procedures developed by Esso-Mobil can produce jet fuels with improved thermal stability to meet these critical requirements.



Clear air turbulence is believed to be related to jet band edge and top of jet stream. Rapid changes in temperature (10°F or more in 1" layer) occur on colder side.



Fast heating of subsonic engines to go into commercial service in U.S.A. is being handled by Esso-Mobil. The system is Trans Canada Air Lines' Vacuum Flare.



Best Pair to Get You There!

Esso-Mobil Oil Company, Inc. and Affiliates
MOBIL OIL PETROLEUM COMPANY, GENERAL PETROLEUM CORPORATION

B-52 + PHP* = -50 lbs.

*Parker Hydraulic Package

Aircraft manufacturers are constantly trying to upgrade their products. Their engineers are engaged in a never-ending search for better equipment. In this search weight is always an important factor. Every pound—every ounce—used is a step forward.

Parker's latest contribution to this upgrading and weight reduction is a Hydraulic Components Package, two of which will be used in the new B-52, with a savings of over 50 lbs. per plane.

Each package contains: two check valves, one deaerating valve, one by-pass valve, one restrictor, one filter and filter bypass.

In packaging these components in housings are eliminated, fewer lines, fittings and mounting provisions are used, maintenance is greatly reduced, installation costs are cut, valuable space is saved, greater safety is achieved in fewer joints means less potential leaks and weight is greatly reduced.

Similar packages are being designed by Parker for other installations.



Let a Parker Team help you

A Parker Team is available to assist you in designing a Hydraulic Components Package to meet your specific requirements for existing or proposed models. If you have any problem in hydraulic, fuel or check valves or are beginning system design get a Parker Team on your staff.



Check valves Deaerating valves By-pass valves Restrictors Filters Filter bypass



Parker

Hydraulic and fluid system components

Parker Aircraft Co., Los Angeles 45, Calif. • Cleveland 32, Ohio
(subsidiary of the Parker Aircraft Company)



*Announcing one of the
most important issues of
AVIATION WEEK ever made
available to aviation advertisers
... the 23rd Annual Inventory
of Airpower Edition,*

MARCH 12, 1956 ...

Airpower in the Atomic Deadlock

"Airpower in the Atomic Deadlock" will feature a full-scale editorial roundup on the major phases of world airpower, tactical charts, forecasts and expanded technical departments will focus on the gigantic task of keeping our airpower prepared to meet any new threat to the free world. In the tradition of past Inventory issues, no effort will be spared to make "Airpower in the Atomic Deadlock" the industry's most useful reference edition.

Research for special reports has been under way for the past six months. The latest information on foreign aviation is pouring in through AVIATION WEEK's world-wide network. AVIATION WEEK editors are traveling on a tour bus throughout the industry seeking out the type of material that will make the edition a top issue of 1956. Volume of

aviation statistics are being pocket into detailed specifications tables covering all U.S. and foreign aircraft, helicopters, engines and missiles.

Your constant readership, usefulness and reference value make the 23rd Annual "Inventory of Airpower" Edition an extraordinary issue for aviation advertisers. Your selling message in this extremely significant issue will reach more than 78,000 of aviation's most important men ... 55,000-plus subscribers plus some 23,000 post-along readers! ... Key engineers and managers are in manufacturing and transportation, in service and procurement centers—military and governmental leaders. A receptive, influential, undoubtedly valuable for advertising to begin with, these top aviation people will not AVIATION WEEK's 23rd Annual "Inventory of Airpower"

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AVIATION WEEK service not just for aircraft, also for defense. 1956 23,000 Post-along readers of current issues plus 55,000 direct subscription readers by Airpower Research Institute direct 1.4 million for every edition copy of AVIATION WEEK (post-along) delivered by personal interview copy (not magazine full). Current post-order exceeds 80,000 copies.

AVIATION WEEK

A MCGRAW-HILL PUBLICATION

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4-4-1956

The Capacity for Achievement

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Librascope, through a unique combination of electronic, magnetic, mechanical and optical techniques, consistently demonstrates an outstanding facility for the production of precision instrumentation and devices.

The creative ability of an exceptional engineering staff and the production capacity of a superbly equipped 200,000 sq. ft. plant facility can be focused on your computer-control problem. Contact Librascope today.



ENGINEERING — Learn about Librascope's new extensive "Project Development Team"... write Mac McKenney, Personnel Director

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COVER: Chance Vought Republic, the Navy's first operational nuclear-to-nuclear guided missile, is hoisted down deck of USS Hancock by steam catapult in test of the world's new, lightweight launcher. The launchers, which work with integral infrared, passive, active and commandable missile launchers. For more pictures and detail, see page 28.

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Reader AFB and APC

AVIATION WEEK, February 20, 1974

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ABOVE: The new Beechcraft Model 75 Jet Mentor

RIGHT: The Beechcraft U-38 Twin T38 Mentor



Sisters Under the Skin

THE NEW BEECHCRAFT Model 75 Jet Mentor is based on the tried and proven Beechcraft T34, now serving the U. S. Air Force, U. S. Navy and five foreign nations. Both planes use many of the same component parts, and *feature* maximum performance, ease of operation and maintenance and outstanding economy. Both have been developed by Beech Aircraft in private ventures ready for military service throughout the world as "off-the-shelf" trainers.

Students can easily start right off in the Jet Mentor without previous flight instruction. On the other hand, the T34 and Model 75 are so similar that very

little transition would be required to convert from one plane to the other.

The new Beechcraft Jet Mentor represents a significant step forward in jet design simplicity. It is *easy* enough to take it, *light* enough to be the world's most economical jet trainer.

PERFORMANCE AND SPECIFICATION DATA

(Engine: Continental J69-T-9 Turbojet)

Cruising Speed	245 mph
High Speed (at 15,000 feet)	295 mph
Diving Speed	500 mph
Service Ceiling	28,000 feet
Range (maximum with reserves)	492 miles
Gross Weight	4,525 pounds
Empty Weight	2,925 pounds
Useful Load	1,570 pounds
Load Factor (ultimate)	11.25 G's
Rate of Climb	1,400 fpm

Beechcraft

Beech Aircraft Corporation, Wichita, Kansas, U.S.A.

HIGH RATES: T-34 Trainers for the USAF and USAF L-33 Transports for the U. S. Army, Jet Mentor, Model 75 Multi-Engine, Super 78 Executive Transport, Model 520 Twin Executive, Model 520 Executive

EDITORIAL

Confusion on the Missile Program

"Added to this increasing strength [Strategic Air Command] each month is our growing stockpile of intercontinental ballistic missiles which represents the most modern and devastating weapons of war in existence today."

This statement last week by Sen. Everett S. Sutherland (R-Miss.), a former chairman of the Senate Armed Services Committee and now ranking minority member of that committee, is indicative of how little accurate information is being dispensed to the public these days on the state of this country's guided missile program. Everyone who has even the remotest connection with the missile program knows that the United States has no stockpile of intercontinental ballistic missiles, but at his home in apartment service, that the first ICBM development program (Cassius) is still in the prototype construction stage and that the second ICBM program (Maveric) was just begun a few months ago.

When quoted on the Sutherland statement an Air Force spokesman replied (as reported on p. 25) that the only ICBM stockpile he knew of must be right in the Senator's office. When *Air Force Week* checked Senator Sutherland's office, we were told that the Senator's statement was correct but no further details could be given because of "military security."

Russian Missile

What is even worse about Sen. Sutherland's statement is that it was made at least four months after the entrance of a Russian 900-mile ballistic missile was accepted as a fact by all of the top-level defense and policy groups of the Eisenhower Administration.

Entrance of this missile is such a well-known fact in Washington that President Eisenhower reinforced the Russian lead in this field at his most recent press conference, although he did not specifically identify the Soviet missile as its range.

The President and that while the Russians may lead in some fields of missile development, the U. S. leads in others. This is perfectly true. But the President did not specify that the Russians hold the lead in long-range ballistic missiles, while our lead is in defense, short-range missiles such as the Douglas F4U air-to-air missile and the Convair F-106 and B-57D Talos surface-to-air missiles.

Symington Positive

Sen. Stuart Symington (D-Mo.) has stated flatly (see p. 27) that the Russians have not fired a ballistic missile many hundreds of miles farther than we have. Sen.

Henry Jackson (D-Wash.), who holds posts on both the Armed Services Committee and the Joint Congressional Atomic Energy Committee, has stated that the Russians may test in the punch with a 1,500-mile intermediate-range missile.

The President has told the public that everything possible is being done to research and develop the missile program in this country "so far as my experts and my people in the Defense Department tell me."

This was in the same week that the top missile expert in the Pentagon, USAF Assistant Secretary Trevor Gardner, resigned in protest over the pace and scope of the entire aeronautical and missile development program and specifically charged that the missile program was not being pushed as hard as possible.

This sequence of events leaves the public wondering just who are the "experts" in the Defense Department on whom the President depends for his information. It also leaves a strong implication that the information he is getting is not as complete or accurate as it should be.

Congress Must Probe

In this matter of conflicting statements it is virtually impossible for the trusting citizen or the legislator who represent him in Congress to discern the truth about the relative status of the Russian and U. S. missile programs.

In the face of this mass of confusion on the missile picture Congress owes the citizens of this country a full and searching inquiry into the true state of our national program in this vital field.

This inquiry should be conducted above the level of partisan politics and it cannot be hampered by phony claims of military security that are designed solely to conceal the truth.

HELP Curtis

President Eisenhower has made an excellent choice in the appointment of Edward P. Curtis to make a long range study of civil aviation development problems and requirements. Mr. Curtis has a long and distinguished record in aviation that began as a fighter pilot in World War I, flying Spads and Navajoes in combat over France. His aviation knowledge has been tempered by years of business experience with the Eastern Kodak Co., of which he is now a vice president.

The job Mr. Curtis is tackling requires action to insure the proper growth of civil aviation as an integral part of our national fabric. Everybody in the aviation industry should give Mr. Curtis all the assistance and support he needs to do his job effectively.

—Robert Harte



FLIGHT DATA IS TRANSMITTED from test aircraft, like this modified RF-4D, to receiving equipment at the G-E Flight Test Center. Direct-reading readouts display the test data, allowing immediate engineering evaluation.

How telemetered flight test data speeds development of G-E flight control systems

By allowing engineers on the ground to evaluate test data while flight tests are in progress, a telemetering system is speeding the development of General Electric flight control systems. Any required in-flight adjustments to equipment or changes in flight test plans are initiated directly to the test pilot. This ability to refine the tests as they are in progress greatly increases the amount of pertinent data that is collected per flight.

General Electric has extensive experience in designing, developing, and manufacturing many types of flight control systems. Valuable experience has also been gained with timing in flight control systems to bombing, approach, and fire control systems. All this experience is being put to use in building flight control systems for the latest supersonic aircraft.

FOR DETAILED INFORMATION on G-E flight control systems, contact your General Electric Aviation and Defense Industries Sales Office, Section 221-4, Schenectady 5, New York.



FLIGHT TESTING is performed at the General Electric wind and approved Flight Test Center at Schenectady, N. Y.

Progress is Our Most Important Product

GENERAL ELECTRIC

ICBM Stackpile?

Defending the Administration's no new program against Democratic attacks, Sen. Everett Schwitzel (R-Miss.) pointed to our stockpile of intercontinental ballistic missiles "as one of the cornerstones of our military strength. He is a member, Republican and former chairman of the Senate Armed Services Committee.

Asked where USAF is keeping its stockpile of ICBMs, a war, Pentagon office said. "Right in Mr. Schwitzel's office. It's the only one I know of."

This is Schwitzel's report. The Air Force program—to reach 117 wings at the end of the 1977 fiscal year—is a little ahead of schedule, and we will have 131 wings at the end of the present fiscal year. All medium bomber wings of the Strategic Air Command are now equipped with our jet B-47's. These B-47's, together with a very large fleet of KC-97 tankers and an extensive overseas base complex, constitute our principal ready striking force. Added to this increasing strength each month is our stockpile of intercontinental ballistic missiles which represent the most modern and the most devastating weapon of war in existence today.

"I had occasion just last week to discuss this progress with Secretary of the Air Force Quaker, one of America's leading research and development scientists. He gave me his personal assurance that this intercontinental ballistic missile program was receiving highest-priority attention. Our forces today represent a deadly deterrent for any country considering an attack on us because of their strength, their modern equipment and their ability to retaliate promptly with devastating effect."

Engine Profits

House Armed Services Investigating Subcommittee has not yet decided whether to hold public hearings on profits of several engine manufacturers, including Pratt & Whitney, and large military aviation manufacturers, after it completed its hearings on the 15 major defense companies.

Basic information on these three categories—as well as the 15 prime contractors—was gathered by the staff during the Congressional session from August through December of last year.

Rep. Edmund Herbert (D-Cal.), chairman of the subcommittee, said that the only doubts remain on public hearings was to cover the 15 defense companies.

Snark to Appear

Watch for a national picture magazine to print a inside story on the sinking of the Argo, a ship and USAF Snark. The picture is officially unclassified but Defense Department had refused to release them to other newspapers or magazines. In this case the string of approval was given to top Defense circles, where Assistant Secretary Robert Tappan Carroll the bill for the publication after standing firmly against release of the same unclassified material to the rest of the press. A conference of top service secretaries finally was held to pass judgment and now much of the Pentagon stands apologetic at White House reaction when the article appears. Regular military officers in the Defense Department's Security Review Office were kept out of the proceedings, exercised no authority over the situation.

Biggest joke to many of them is that one of the Snark's chainstems salvaged is a picture of a photograph on a wall at the office's club at Estab. AFK.

USAF Speech Policy

Wide and obvious gap between statements of Air Force Secretary Donald Quarles and top USAF officials on relative strength of his jet B-47s in the intercontinental missile race has been closed last week. That Chief of Staff Gen. Nathan F. Twining and his vice chief, Gen. Thomas D. White, had been ordered to stop making speeches and statements. The truth is less subtle and much harder to understand. USAF's Office of Information Services, headed by Brig. Gen. Robert L. Scott, Jr., has been told a will be held strictly responsible for the content of all USAF speeches.

Airmail Postage Increase

Postmaster General Arthur Summerfield has ordered his drive for postage increases including an annual increase from six to seven cents an ounce, that, as in the past several years, it has not with less opposition in the Congress.

Shortly after Summerfield made his request for postage increase to affect the Department's deficit of \$1,000 a month, Sen. Ole Johnston (D-S.C.), chairman of the Senate Post Office Committee, announced an extensive investigation to find other ways to cut Post Office costs. Johnston declared that "Every effort should be made to reduce the deficit through maximum economies" before postage is increased.

Cold War Buildup

Defense Department has named a new Pentagon "Fast Staff" to oversee the building's defense population now in 75,000. Personnel peak during World War II was 25,500 in April, 1945. Former Air Force Secretary Stuart Symington, now a Senate critic, points out that the increase at 2,500 makes a big jump in the number of Secretaries—from eight to 31.

Airport Politicking

The announcement of \$79 million in new airport projects brought charges of Republican politicking against Secretary of Commerce Brock Wicks and Under Secretary for Transportation Louis Rothchild.

Rep. Francis Pritikin (D-Cal.) predicted that advance of the projects were dominated by Republican National Committee for local Republicans in this could draw credit for obtaining them.

Secretaries Wicks and Rothchild have already demonstrated their political concern for members of Congress at the majority party by their conspiracy to drive credit for a program for Administration under attack to destroy. Pritikin complained, "It is often said, they give parrotballs but are willing to adopt the bird."

The bill is not likely to lose here. Pritikin a chairman of the Appropriations subcommittee which handles funds for airport projects.

—Washington staff

Firing of 900-Mile Russian Missile Spurs

Speed-up order in work on anti-missile missile; Democrats shift Administration on defense policies.

By Robert Hays

Washington—Representatives from Russian test flights of a 900-mile-range ballistic missile are changing the scope and pace of the Defense Department's anti-missile development program. The Russian test flights have revealed a surprising degree of progress during the past six months and indicate that the missile is equipped with some form of guidance.

Leadership in the Russian missile has been accepted as a fact by the Defense Department and National Security Council staff but full public acknowledgment of the Russian missile came from Sen. Stuart Symington (D-Mo.) in a national television address when he stated:

"The Russians have tested their long-range ballistic missiles beyond limits further than anything the Soviets has ever tested."

The longest range ballistic missile yet tested in this country is the Army's Redstone, which has a range of about 200 miles—roughly equivalent to the German V-2's performance in 1945.

Continuation by Ike?

President Eisenhower's recent public acknowledgment that the Russians are ahead of this country in some portions of the missile field was interpreted as a veiled confirmation of the existence of the 900-mile Russian missile.

Since the existence of the Russian 900-mile missile was accepted by the Congress and by the National Security Council, the U. S. missile program has

been changing in the following directions:

- President Eisenhower has become personally concerned about the relative progress of U. S. and Russian missile development. Three months ago he ordered weekly progress reports made to him by the missile program by Defense Secretary Charles E. Wilson and Maj. Gen. B. A. Schriever, commander of the Western Development Division of the Air Research and Development Command. The President now demands details on these progress reports from Wilson and Schriever on his last day of the missile program instead of on the missile through which it is forwarding papers from the Pentagon to the State Department.

- Cooper's Act (SM-65) program has been accelerated and a prototype Atlas is being built in a special portion of Convair's San Diego plant.

- Second intercontinental ballistic missile programs have been organized, with the Glenn E. Martin Co. as the prime contractor. Martin is building a new plant in Denver for the X-4500 program.

- Intercontinental range ballistic missile program has been changed to include both an Air Force project (contracted to Douglas) and a joint Army-Air Force effort (led by the Army's Redstone project at Huntsville, Ala.). However, there are signs that the Air Force is happy about the individual activities of the former General Berkeley's V-2 and experts are now leading the Army missile program at Huntsville and in making efforts to get off and on its own (ICBM) program.

- Increased interest in the anti-ballistic missile defense missile. This program has emerged from the study phase into active development.

Active has jumped into the lead on this program with an development contract to Bell Laboratories USAF anti-missile program is still in the study phase but is expected to shift rapidly into active development.

Basic decisions on the missile program were made last November after existence of the Russian 900-mile missile was officially acknowledged. Instead of continuing on the Atlas program that had been organized on a five-year basis late in 1954, the Pentagon decided to broaden missile work by adding the second ICBM program and seeking an ICBM program for all their services.

It is on this decision to double the level of top of technical facilities and scientific resources available in the bal-



MAJ. GEN. B. A. SCHRIEVER, President of the President on missile program.

lance missile field—instead of concentrating them on a single Manhattan project type of crash program—that the current scientific, political and scientific debate is concentrated.

Critics of the broadened missile program are the fact that both ICBM programs and both ICBM programs represent the most basic technical approach to the ballistic missile problem, all rely on the same sources of propulsion, on the same sources for the critical nose cone development and on the same basic pool of scientific talent.

History of Atlas

Proponents of the broadened missile program feel it is a mistake to concentrate all the long-range missile effort into a single program, that it is necessary to have several programs active in case one fails and that other sources of scientific and technical resources to avoid a USAF monopoly on long-range missile development and operation.

There also is considerable agreement on technical and system missile groups that it is basically wrong to start now to develop an intercontinental missile (about 1,500-mile range) when the Russians are already close to this goal. Proponents of this view believe that the U. S. should concentrate all its available funds, facilities and scientific talent in an effort to beat the Russians to the intercontinental ballistic missile (3,000-mile range).

The Atlas program has had a dominating effect in the Defense Department. It was regarded as a practical project for all of the top-level Pentagon missile staffs, competition in the 1954-54 period. It resulted along on a less than a billion-dollar annual budget until 1956.

U. S. Changes

Combination of a major scientific breakthrough in developing smaller packages for fusion-type nuclear warheads and current USAF interest—expressed by Trevor Gardner, who recently resigned as Assistant USAF Secretary for Research and Development (AW Feb 11, p. 23)—put the Atlas program on a firm basis, the end of 1954.

The smaller fusion-type warheads allowed two major problems in ICBM development:

- Accurate destruction possible with the smaller warhead of fusion warheads is, the guidance system accuracy required to reach a predetermined target over a 5,000-mile range.
- Reduced weight of the warhead payload made possible rapid reduction in the power required to deliver the fusion-type warheads on target over a 5,000-mile range.

Sen. Symington Sparks Debate Over Airpower

By Katherine Johnson

Washington—Sen. Stuart Symington (D-Mo.) directly challenged President Eisenhower on the guided missile program, highlighting the racing attack on Congressional Democrats to the administration's defense policies.

He stated flatly in a Senate speech that the U. S. "behind the Soviet Union" in the long-range ballistic missile field, the most important new weapon the world faces today.

Other developments:

- Sen. Charles McNamara (D-N. Mex.), chairman of the Joint Congressional Atomic Energy Committee, repeatedly repeated the demands of Sen. Henry Byrd (D-Wash.) for a "real" program on guided missiles.

- Disagreement with Defense Secretary Charles Wilson's plan to issue a new "Atlas" of guided missiles and the proposal by others to develop a Manhattan Project type of program. He pointed out that he believed Sen. Symington proposed that that one of the services should be given by members of the service. "A Manhattan Project type would take the new weapons system out of the services and then, at some later date, be fed back into the effort of working it back into the services, with all the attendant delays and miscommunications," he said.

- President Eisenhower was called upon by Rep. Thomas Abernethy (D-Min.) to assume personal responsibility for guided missiles.

- Rep. George Mahon (D-Tex.), chairman of the House Appropriations Sub-



SEN. STUART SYMINGTON. Direct challenge to President, U. S. "behind" USSR in long-range ballistic missile development.

committee, on the Armed Services reported his "concern" over the country's guided missile position after hearing about testimony from Rep. Delaney, and Air Force officials, and Rep. Thomas Gardner.

- Sen. Arthur Berkeley (D-Ky.) pointed to the Democratic speech of Gen. Thomas D. White, USAF's Vice Chief of Staff (see p. 21) as "undermining the protest of Mr. Gardner which resulted in his resignation."

Eisenhower Challenged

Following an statements made by President Eisenhower on the guided missile program at his press conference Feb. 8 (AW Feb. 11, p. 23) and Symington's challenge of these remarks. Eisenhower: "One of the things you have to watch is this don't try to do things too much at once or you get in each other's way, and run both them off, through the confusion."

Symington: "What if we find ourselves in that what the President says should not be done is exactly what is being done today."

The missile development picture is being spread confusion to the public where concentration on the most important weapons of all development of the long-range, ground to ground missile, is being seemed to move people more than a step in the new war.

Eisenhower: "This thing is being accelerated and developed as rapidly as it can be done in this country so far as my experts and my people in the Defense Department," he said.

Symington: "But who is the expert?" is at the Assistant Secretary Mr. Gardner, under whom the long-range missile program was being developed.

"Or is it the Secretary of Defense,

who, not so long ago expressed himself as believing the development of an atomic missile was comparable to feeding and mowing potatoes into barns when they're full?"

Eisenhower: "In certain fields I am sure we are well ahead of the other side. In certain fields I think there is probably ahead of us. But there are certain fields in a great big field."

Symington: "This might lead some to believe that our being ahead in some respects and the Communists being ahead in others is nothing to worry about, sort of a balance."

"The facts are that our missile development may be ahead in the short range area, but there missile development is ahead in the area that counts is in the most-of-the-long-range area."

Eisenhower: "Overall we have no reason to believe that we are not doing everything that human science and money and resources can do to keep our position in proper posture."

Symington: "That is the correct area of focus, we are spending almost on a basement level."

Symington also revealed that when he learned that the U. S. might be behind in its superiority in the field of the Min. Min. display of aircraft in Moscow, the President declared the following day "It just isn't true that the U. S. has lost a tremendous amount of the great technical confidence and development of its airpower."

Clara White's Statement

Pointing to Gen. White's statement that "no airplane other than the Soviet" was approaching as quickly and superiorly as in 1945, Symington declared:

"In other words what I predicted last time is now being demonstrated, acknowledged by this Administration as well as true."



REP. GEORGE MAHON (D-Tex.) chairman of House Appropriations Subcommittee on Defense.



J. E. DANDRIDGE. Proposed program for a United States missile program.

Ramo-Wooldridge, ARDC Groups Act as Missile System Managers

Los Angeles—Western Development Division of the Air Research and Development Command the Special Aircraft Project Office of Air Materiel Command and the Guided Missile Division of Ramo-Wooldridge Corp. are in an effort to function as missile system managers for the Air Force guided missile program.

Western Development Division is composed of about 180 USAF officers, commanded by Maj. B. A. Scherzer. All but four or five of these USAF officers hold engineering degrees with a high percentage of aviation degrees and a few Ph.D.s. They have civilian careers and occupy the same function in the Ramo-Wooldridge Corp. Guided Missile Division near Los Angeles Technical Airport.

Although Western Development Division is part of ARDC it has no authority to operate independently, an executive missile program set within its jurisdiction and does not require ARDC approval for its actions.

Special Aircraft Project Office holds a similar position within the Materiel Command. It has one staff and one civil where officials Government contracts are needed. It does not need AMC approval for its actions and it has authority to sign contracts with contractors for electronic hardware, a considered necessary for the missile projects under Western Development Division jurisdiction.

Scientists Available

Ramo-Wooldridge Corp. Guided Missile Division provides a staff of technicians and scientists who are available to provide contractors for guidance and assistance in development of specific missile programs. Western Development Division's feeling is that the Ramo-Wooldridge staff's capabilities can be applied particularly where contractors are venturing into new fields and do not have their own staff or facilities to cope with new types of problems.

Ramo-Wooldridge Corp.'s position in Western Development Division and the USAF missile program has been a source of friction with aircraft firms holding similar contracts. The aircraft firms have been reluctant to divulge their technical data to Ramo-Wooldridge personnel on the grounds that the position is that a contractor in the missile and avionics fields.

Some major missile contractors feel ARDC is getting there at a competitive disadvantage in forcing them to turn on technical data to another firm that

is also making the same type of equipment.

These three units—Western Development Division, Special Aircraft Project Office and Ramo-Wooldridge's guided missile division—operate as a unified command, with WDD operating as weapons system manager, SAPO handling the contracts and Ramo-Wooldridge handling technical assistance and evaluation when needed.

Site-to-Site Radio

Within Western Development Division is a staff of about 10 technical people to use administrative efforts. Among the technical people are specialists in weapons system development, operational evaluation and planning.

While Western Development Division was organized, ARDC looked around for an organization that had the

scientific and technical staff to supply some of the military management of the missile program. ARDC conducted a survey of potential suppliers of the type of talent and picked Ramo-Wooldridge's Guided Missile Division.

Overall, the trio of WDD, SAPO, and Ramo-Wooldridge act as weapons system consultants to USAF headquarters. USAF tells them what it wants in the way of operational studies. Western Development Division develops what forms the weapons development will take. SAPO lets contractors bid development of the weapons hardware and Ramo-Wooldridge does technical evaluation of contractor proposals, provides technical assistance and helps get the job done. This arrangement has evolved from Western Development Division's original function of simply riding herd on ARDC contracts in the West Coast.

In first series set of contracts awarded the Convair Atlas intercontinental ballistic missile program and was later extended to include the intercontinental-range ballistic missile.

Ramo-Wooldridge Plans New Plant To Step Up Avionic Production

Los Angeles—in a move to establish itself as a major producer of missile equipment, Ramo-Wooldridge Corp. has laid out, unannounced plans for construction of a full-scale manufacturing plant near Littleton, Colo., southwest of Denver. The plant will be located on a 64-acre site on which the company already has built a test site (ENR Jan. 16, p. 15).

The new Ramo-Wooldridge efforts hope will enhance the company research and development activity, its support of the Government's work in full-scale production. Its present facilities are engaged only in prototype production of missile devices.

Grounded for a 175,000 sq. ft. manufacturing building will be broken this spring. It probably will acquire another 100,000 sq. ft. for the structure to be completed, tested up and ready for production.

The plant is laid out to expand in three directions, and the new building will occupy one small portion of the 640 acres. There are no present plans, however, for additional buildings.

No specific details are now planned for manufacturing in the new facility. But the company also wants to be able to manufacture in the facility, including aircraft for control systems, radar systems, electronic computers and advanced communications equipment. The company also wants to be able to manufacture business to develop

as quickly as possible, but it is unlikely that commercial products will be produced at the new plant during its early stages of operation. Later, Ramo-Wooldridge expects to produce automation and data processing equipment for commercial applications.

The plant is a one-story building, will include machine shops, a sheet metal shop, metal process facilities, extrusion facilities, environmental test and inspection facilities, classrooms and office space.

Along with manufacturing personnel, there will be a staff of at least a small permanent engineering staff at the new site. This force will be supplemented by members of the Los Angeles engineering staff.

In keeping with the Government's disposal policy, Ramo-Wooldridge decided not to locate the new plant on the West Coast. Denver was selected because of its research, development position in Los Angeles, its air support capabilities, its proximity to the necessary close liaison between research and development and manufacturing.

Another reason for selection of the Denver site is that there are skills and talents available there for the type of manufacturing the company will do.



RESULTS, second lightweight dolly launcher, is moved up to show catapult for test firing from deck of the USS Hancock.

New Launcher Weds Regulus, Catapult

The smoothness and stability of the Chance Vought Regulus, Navy's first operational nuclear-rocket guided missile, has been increased by the development of a lightweight launcher-dolly that permits catapult launches and does away with the cumbersome equipment previously required. The three-wheeled launcher, fabricated from steel tubing and shown in pictures above and right during tests aboard the USS Hancock, weighs just one-fourth as much as the portable launching platforms and hoists hauled required for earlier rocket launchings.

The missiles can be hoisted aboard the launchers, where and stored on the carrier's hangar deck. When ready for use, the dolly is wheeled to the carrier deck and hooked up to the stern catapult ready for launching. At the end of the catapult run the Regulus takes to the air and the launcher is pivoted into the air. David Douglas, the test was begun by Chance Vought last spring.

The design of the Regulus dolly was first conceived by Chance Vought in 1947, and two years later eventually evolved into a convertible test and training missile with a retractable landing gear and a non-reusable air-to-air missile.

It has been launched successfully from the decks of carriers, carriers and small carrier ships, from launchers and from submarines.



WITH STRAIN taking up from the hidden catapult, Regulus and launcher begin their run.

NEARING END OF RUN, catapult prepares to launch Regulus and split launcher into air.



Vought's Team: The Old Meets the New

Glenn Vought's new F4U Corsair (topright above) which promises to become the Navy's mainline fighter, fits in fortuitously with the older F7U Corsair. The 1,000 mph plus Corsair is now in production at the Vought plant in Dallas and is scheduled to reach the fleet in an operational form sometime next year. The Corsair entered the fleet late last year after a long series of delays. At night, the F7U is back-ground is forced to leave its landing gear to hold the formation. The Corsair is powered by a Pratt & Whitney J37-P4 turboprop engine with afterburner; the Corsair has two Westinghouse J46-WE-8 turbojets.



IBM Radar Bombing System for B-52s

The USAF's newest radar bombing and navigation system (the MA-2) for use on the Boeing B-52 was formally awarded last week by International Business Machines Corp., producer of the system.

The system weighs 1,457 lb., occupies 30 cu. ft., and will cost approximately \$160,000 (including installation and maintenance costs) when it enters the full-production stage.

The MA-2, called IRANZ (Bombing Radar Navigation Equipment), is said to have "unprecedented reliability."

The contract for the system was awarded to IBM in 1951, about the time that the Air Force was experiencing considerable reliability problems with the K bombing system used in the B-36 and B-47. This difficulty explains

the emphasis on reliability in the MA-2 design.

The system employs a bombing radar system, developed and produced by Raytheon Manufacturing Co., together with an optical bombaimer.

The bombing navigation computer employed by IBM is basically an analog-type device, although the system does employ "some digital publicizing techniques," a company spokesman says.

In answer to an Aviation Week question, an IBM spokesman said the system at the present time does not use "analog publicizing techniques."

The MA-2 enables IBM's first entry into the field of complex airborne bombing systems, although the firm is a major supplier of digital computers for use in the air defense SACF system.

The MA-2 bombing/navigation system is based on an original Air Force sponsored study contract with the Princeton Elmer Co.

Douglas Announces Larger DC-8 Version

Douglas Aircraft Co. last week announced details of a larger, longer-range version of its DC-8 jet transport, one of which probably will be powered by Rolls-Royce Conway bypass engines.

The aircraft, which will be offered for both domestic and international use, and apparently was designed to meet the challenge of Boeing's intermediate version of the 707 (AW Week 12, p. 7), will have a cruising speed of 550 mph, a top cruising speed of 570 mph, and a maximum range of 6,720 statute miles.

Its wingspan has been increased by 8 ft. to 139 ft., nose section and its length by 166 inches to 145 ft., 10 inches.

Douglas and other engineers can choose their propellers from among Pratt & Whitney J57 and J73 and the Conway bypass.

Strongest Statement Yet:

White Warns of Red R&D, Production

Communism-Soviet Russia was only in "midway scientific and technological submerses of a better side" than the United States, the state is "bearing in its own gun-producers," Gen. Thomas D. White, U.S. Air Force Vice Chief of Staff, said at the opening of General Electric Co. new jet engine facilities here.

Gen. White's speech was the strongest warning yet from either a military or civilian leader on Russia's progress in the race for superior weapons. It came only a day after USAF Secretary Donald Douglas spoke in Texas warning the importance of technological developments.

Gen. White said the Russians have:

- "Behind our back have the heavy jet bombers."
- Developed a "lead-line considerably less than ours on all other aircraft."
- Put out one half several projects on a civil line, including a transatlantic capacity for research and development.

To help meet this challenge, America must recruit volunteers to do more research and development on its own. Gen. White said:

- "Almost almost the impossible job" with "more than remarkable progress in four years where this once was at a disadvantage—The Soviet was going economy right after World War II, then production line, their technology and the resources readily available in their."

Slavish R&D Duller

It is ironic to debate whether or not their production engineering is as sophisticated as ours, Gen. White said. "The fact is that their have been and are outstripping us in all categories but modern weapons technology."

The speech delivered by Gen. White originally was written for USAF Chief of Staff Gen. Nathan F. Twining. Gen. White gave it when other circumstances kept the Chief of Staff at his office in Washington.

Although Gen. White did not say how Russia's work on missiles, he dealt at length with attack and development generally, pointing out that it is "a business in which there is a constant and intense competition."

"The taxpayer and the legislator must make decisions as to how to use our national resources for or against, not failure," he said. "This makes the research and development duty hard to get."

The statement came shortly after Thomas Gordon, Assistant Secretary of the Air Force for Research and De-



GEN. THOMAS D. WHITE

velopment, regarded as the closest to the successful light jet engine research and development funds (AW Feb 13, p. 33).

Gordon's Fight Recalled

Although Gordon's fight with USAF Secretary Douglas and Douglas Secretary Charles E. Wilson has been interpreted widely as a battle over funds for atomic research, Gordon himself made it clear that he had sought funds for research in a wide variety of fields related to small weapons research.

Gen. White limited specific comment on any response to the latest one actually "in the Soviet system" he said.

- "They now have a sweeping heavy jet bomber, the first in many respects it equals our new B-52, which is the best that American technology has yet been able to produce."
- "They have a long-range bombing bomber, the B-11. The first in their long-range bomber, comparable to our B-11. The B-11 is probably one of the best in the world."
- "The Soviets also have a medium jet bomber very similar to our B-47. We still have a big lead on them in medium jet bombers."
- "They have several thousand fighters which are better than our F-105 and F-104. They also are producing new fighters which compare to our F-100."

"Approaching in Quality"

Could go on and on, Gen. White said. "No anyone other explain then approaching in its quality and its progress on its quality."

During the last few decades, we Americans have had a talent as which

we stopped improving," he said. "I refer to our talent for production and production. When challenged by aggression, we have always depended upon our mass production methods to hold our own."

"There is the case of deep concern—the Soviets are presently beating us at our own game—production."

Of course we can outproduce the Communists," Gen. White said. "There is no doubt about that. Our production methods are not the reason we are falling behind."

Reason for Lag

One of the reasons that we are dropping behind is that the Communists are making scientific and technological advances at a better rate than we are."

The fact that Russia "can put out not just several projects on a crash basis, but a steady stream of projects in research and development," Gen. White said, but it also "indicates a changed in cost and its better factors and its willingness to pay."

The Russian "achieved their gains in weapons by securing the new role of a military dictatorship," Gen. White said—directing "bright young Soviet" into scientific and technical areas "in no case of their own," making them build "bricks instead of airplanes, submarines instead of commercial vessels, bombers of the cost of automobiles and radio instead of television."

"Every action and decision affecting research development on production is working a case for the dictatorship," he said. "By quotas, subsidies, awards and plans the Soviet government controls everything right down to the last nut and bolt."

'Everybody's Business'

To win the competition with the Soviet system, Gen. White said, "we must realize that the defense of this country is a national and not an individual government's. That is both the fact and the privilege of democracy."

"The products of American capitalistic and great corporations—great aircraft along with their consumable functions of action, their share of our national responsibility, to provide our own defense."

Force levels "numbers of aircraft and weapons" we cannot afford to be political and military leaders," Gen. White said—and "we can only expect our private industries to meet the national responsibility to meet the national responsibility."

Instead, he said, "our great corpora-

tion on best solution increased efforts to the area of research and development."

In addition to the fact that "the research and development dollar (is) hard to get," Gen. White listed three reasons why industry must devote resources effectively to research and development:

- Research, especially basic research, is best accomplished in an environment of complete freedom. Governmental projects are uncomfortable to see evolve; people are able to operate in a completely free environment.
- If our Government goal first, and research controlled, all the research resources in Iraq at hand, there would be little difference between our Government and that of the Soviet Union. Private initiative would become stifled, as it is in Russia.
- This, he said, leaves large expenditures with three alternatives:
 - They can do back and work for Government research and development money to cover that way. This would eventually allow the Government to get out at hand of all that our nation would like to develop or achieve.
 - Our Government, in disposition

Renegotiation Denies Net Worth

Washington—The Renegotiation Board has denied that return on net worth is a compelling factor in its decisions ordering defense industries to make refunds on Government contracts.

Although the announcement did not mention the aircraft industry as Boeing Aerospace Co. specifically, it clearly was a reply to Boeing's contention that the Board placed too much emphasis on net worth (A/27 Jan 23, p. 10). Boeing has appealed a Board determination that it must refund \$9,622,340 on contracts won in 1952, averaging.

The Board decided it "does not regard any particular rate of return on net worth or capital employed in excess per se."

It said it "does not attempt to equate its determinations respecting the suitability of any given industry from the standpoint of return on net worth or capital employed, inasmuch as renegotiation obviously is not an anti-inflationary device."

The Board does not place special emphasis on the net worth and capital employed factor as distinguished from the other statutory factors.

Boeing's Case

In the Boeing case, a company spokesman declared that return on net worth "was the controlling factor" in that case. He argued that it did not "constitute an unreasonable rate of the price."

and inaccuracy, could stop it and control the research and development and the entire activity of new industries. That, of course, would be contrary to the very way of our life we are trying to develop."

• "Our industries can sell up their assets and push in even harder to add to governmental sponsored efforts to keep us ahead technologically. Only in this way can we keep the U.S. ahead in the arm and side to prevent war by being able to use it."

• "We have little choice," Gen. White said, and "our leading industries are accepting the third alternative." Even so, he said, "In an open, private, sponsored research and development in the free, unfettered yet a few companies, Gen. White said, are making money in the right direction—among these General Electric."

He said the "evidence of scientific progress and progress" in G.E.'s new jet engine facility and the research efforts of other companies are "the results of patriotism and good business." It is good business to succeed," Gen. White said. "I am convinced that our survival depends on our technological progress."

To this, the Board replied:

"The Board denies to re-emphasize the fact that reasonable profit as determined on every case by its own office is the basic principle of its action, and not by the application of any fixed formula with respect to rate of profit on sales or rate of return on net worth or capital employed, or any other formula."

Government Assistance

"That it is not to say, however, that the return on net worth may properly be viewed as an appropriate factor."

The Board then declared that the achievement of profit to capital and net worth is "one of the consequences." It added that it refuses merely profit and is not intended to provide an incentive for investment.

Turning again to the aircraft industry, the statement then pointed to the negligence on contractors who receive financial assistance from the Government.

There are the policy it is to give some favorable consideration to manufacturing firms which their own financing, because a loan capital is applied by the contractor, the contractor's contribution tends to be that of unguaranteed only.

Increased Return

An example of this, the Board says "is to be found in a case where an increase in Government contribution facil-

ties enables a contractor to advance substantially expended volume for defense purposes."

In such a case these will often be a significant increase in contractor's rate of return on net worth over the non-military producing years, which possibly will evaluate in a contractor's rate of effect of increased volume and sustained Government assistance.

"Generally the Board must consider that fact together with all other relevant factors, in determining whether contractor's profit on the expanded responsibility has been a reasonable return on the expended volume."

SAC Still Reds' Major Deterrent, LeMay Says

Washington—The fact that the Communists have been the Government's major deterrent in long-range nuclear power does not detract from the deterrent value of our own Strategic Air Command, in the opinion of its chief, USAF Gen. Curtis E. LeMay.

Gen. LeMay told a Washington audience that he does not expect an attack on the United States to long as his command can promise disaster to the enemy.

"As long as a potential aggressor is convinced of this," he said, "I do not think we have to worry about a major war. Our main job is to keep him convinced."

The Strategic Air Command commander said these three ideas for his audience:

- They can find their targets with certainty. By aerial navigation, they can fly to within 15 miles of any spot on earth from there, they find three precise target by air.
- They can destroy a specific target. On practice missions the target is not only a city but also a specific zone of the city.
- They can get home from the target with only a loss as good as in World War II, when the losses were less than 2%.

USA's deterrent power lies in preventing an attack, Gen. LeMay declared, an instant and sustained counterattack by his aircraft would look out the Communists' eyes.

They said include heavy bombers and fighters, weapons, missiles, fuel supplies and possibly his entire industrial system.

The general emphasized that the "terror being" concept was based on the U.S. as public opinion and recent history to be that of unguaranteed only.

He said jet-fuel long-range bombers are coming, along with the guided missile, but said they are not SAC will depend on bombers and crews of the type in use today.



OUTWAT model of General Electric's proposed altitude engine test stand shows (1) as supply compressed, (2) as turbine, (3) as heater, (4) as test section and (5) as test section exhaust outlet. The stand will be completed next year.

GE's Aircraft Turbine Division To Install Mach 3.5 Wind Tunnel

General Electric's Aircraft Gas Turbine Division has announced plans to add a \$10 million engine wind tunnel to facilities already valued at \$100 million.

The new facility will test engines three times more powerful than the present 10,000 to 15,000 lb thrust test at altitudes of Mach 1.5 and 50,000 ft. Construction is expected to begin early this spring and completion is scheduled for 1970.

Aside from the wind tunnel, General Electric has the intent to:

- Protect its advanced engine's altitude performance parameters.
- Check the mechanical strength of various engine components during altitude operation.

Flow Simulation

The wind tunnel will be made up of an 18,000 lb thrust powerplant driving sections, as an inlet duct (inlet) and two alternate test sections, each followed by exhaust elements. The engine test section will be altitude, 15 ft in diameter. These will include the altitude pressure on the engine but not the inlet.

The flows will be simulated at the engine inlet by a much smaller duct engine section, which will duct the exhaust flow to the engine's inlet. On some occasions the exhaust flow can be directed in special tests to the

inlet of a particular aircraft's induction system. This will allow researchers to observe in a single test the effect of the duct upon the engine. On larger engines the ducting must be duct connected, but, on smaller engines, the test setup may be of the blow-by type, where a gap is left between the end of the apparatus inside and the engine inlet.

Although the facility will not be large enough to fully simulate a pebble in engine, things importantly at altitude, variation in variable intake throat and angle of approach to the engine inlet will allow GE to fly engines from sea level to altitude and back and even to start the engine (by windmilling) in case of altitude start-up.

An expanded set of the cell, according to E. E. Storck, manager of development facilities, is at present GE to evaluate whether their engines are getting proper ducting from the turbine ducts.

He stated, however, that General Electric had any intention of designing its own duct.

Other Additions

Testing a future plan for the facility include adding a section powerplant at the exhaust end of the inlet to increase its ability to do so without get too big, especially on the smaller engines. Other additions to the Executive

(General) development facilities, most of which have had past conflicts and were scheduled for the next year, will include:

- IBM 704 digital computer installation for input output for advanced engine designs.
- The wind tunnel, which is currently under way down to look up with other GE plants for maximum utilization.
- Magnetic tape data reduction center for engine data.
- High frequency phase measurement, particularly blade and inlet vibration.
- GE apparently has developed a dual in communicating and taking data on the existing parts of its facilities.

The announcement that by delicate drafting operation to insert thermocouples and strain gauges which are used to interrogate multiple data sources, which, in turn, transmit the data to 15 channel tape recorders, the frequency analysis of the processed data in its data reduction center, GE can pinpoint troublemakers among the compressor and turbine blades.

• General Electric and Hughes Aircraft Co., which develops engine controls to match the new engines as well as those manufacturers have been developing flight controls. The system is planned around a control analog computer station equipped with General Electric and Electronic Associates units. Actual control parts, sensors, amplifiers and actuators can be built in with the reconfigurable analog computer to run the design and test of the engine.

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Missing control parts during early design stages can be accelerated by the analog computer.

Then, the whole control part of the building can be wind into one building— "interfacing" of the system in the design and test of the engine.

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Little additional news of the GE program for the next year, especially project was officially released.



MODIFIED CH-1 helicopters with boundary layer-control system on main rotor hub and Cessna 310A used to test boundary layer system

Boundary-Layer-Control System For Helicopters Tested by Cessna

A boundary layer control system for helicopters that promises a substantial performance breakthrough for rotary wing aircraft has been successfully flight tested by Cessna Aircraft Co., Wichita, Kan.

The program which involved a modified Cessna CH-1 helicopter, is the first successful application of boundary layer control to this class aircraft. It was the culmination of three years of study by the Air Branch, Office of Naval Research, and the Army's Transportation Corps.

Cessna officials refused to comment on the performance gains revealed during the tests except to say that "all components were meticulously planned with the results." It is believed that the CH-1, contributed by Civil Aeronautics Administration for a top speed of 123 mph, achieved considerably higher speeds with the boundary layer control system in action.

First flight by the modified CH-1 was made last June 30 at Wichita, and this phase of test program was completed last month. It involved several flights to 30,000 ft. Cessna said that the Office of Naval Research chose the CH-1 because of its high installed horsepower and aerodynamic cleanliness.

Delays Blade Stall

Basically the system is designed to delay the onset of rotating rotor blade stall which has been a major factor in achieving high forward speeds in helicopters.

Use of boundary layer control permits the rotating blades to attain higher lift coefficients at higher than normal speeds.

Developed by Cessna as a result of wind tunnel tests at the University of Wichita, the system installed in the

CH-1 test vehicle has an air pump installed in the right foot and in the cabin acting as an ejector. The pump sucks air into the rotor blades through slots in the upper rotor surfaces through the blade suction to the air inlet hub where a continuous cooling wire and transfer chamber permits entrance of the air into the ejector from which it is vented outboard on the left side of the rotor just behind the cabin door.

Boundary Layer Operation

The ejector valve applies suction to the blade slots only over that portion of the rotor azimuth where blade stall is likely to occur.

Profit Probe Aim: 'Total Picture'

Washington—The House Armed Services investigating Subcommittee's forays on aircraft industry profits will give the total picture of all procurement for the Navy and Air Force," said the total picture of industry," and will not be a partial inquiry. Chairman Ed and Robert (D-La.) has stated.

"There has been some loss in silence of aircraft about that subject simply because the whole story has not been told," Rep. Robert said.

"There has been suggestion of excessive profits, of subcontractor or corporate contracts, there have been failures assigned to a multiplicity of things. But failures must be measured against the success."

President J. L. Atwood of North American Aviation, Inc., the first witness, agreed that "industry is severely reprimanded period, the American people should have the facts about industry performance at all times." He also heaped his company could "con-

The ejector receives its power by means of a pulley on the drive shaft of the CH-1's 260-hp Continental P5-CH70-A engine. The drive shaft can rotate a Glover timing belt and a drive pulley, incorporating a hydraulically actuated clutch. The pilot can engage or disengage the boundary layer control system in flight at will by means of a valve in the cockpit.

The special main rotor blades were designed and built by Power Aircraft Co., Glendon Heights, Pa. They consist of steel D-sections comprising the leading edges with bonded fiberglass ribs, spars forming the top and bottom surfaces of the airfoil chords.

Cessna's previous experiments with boundary layer control has been with fixed wing aircraft. Several tests ago it installed a cooling air system in a modified L-19 liaison plane which incorporated two oval flow fans at the wing

inlets as a contraband wing.

Rep. Robert stated that the hearings are "not a partial expedition." He said the objective is to "consider the total picture as it is disclosed by the companies from their own books and by their own officials."

Clegg J. Martin Co. was scheduled to be the second of the 14 major aerospace manufacturers called to testify. The investigation is covering cost factors, profits and production schedules from 1952 to August of 1955. The investigation has received contracts covering earlier periods.

Rep. Robert said the subcommittee does not "surrender by suggestion or succumb to elaborate lies or evasion, that there has been an unwillingness not to be the order of appearance of the companies, that any company in the target of the subcommittee's inquiry."

Picture Credits:

27—Wide World

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Performance Map Shows Compression's Effect



Efficiency Map Showing Compression Principles



Installation in Stratos Freon Refrigeration Test Cell

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Stratos' positive displacement compressor is ideally suited for pumping gases against high pressure ratio loads at relatively low flow volumes such as are involved in freon refrigeration systems for transport aircraft. Compression ratio is built in, involving backflow compression, and is independent of speed. The compressor is simple and simple in construction, requiring no complex valving or control systems. It can operate at high speed—up to 40,000 rpm—keeping unit and drive, size and weight down. Drive can be mechanically coupled electric, turbine, hydraulic or direct from an engine.

Two helical lobes rotate trap the entering gas, compress it in a confined area and deliver it to an exit port in the design pressure. The rotors are of a patented design, with a unique form already proved in a variety of industrial and aircraft applications.

Stratos currently is developing from refrigeration systems, incorporating this compressor, for use in large transport aircraft. Other applications—such as pressurizing of high altitude aircraft—are being developed.

For further information on the interesting developments in compressors write to:



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CONVERSION TEST begins (left) with action as vertical aircraft positions



At right, action being forward in action to horizontal

XV-3 Converts In Ground Test

Bell's XV-3 rotor type convertiplane has successfully completed its latest test series conversions from helicopter to fixed-wing configuration and back again by through the conversion rig. Tests, Spence photographs beginning at top left show a typical test run. Other component testing and loading gear drop tests have been performed since the Army convertiplane completed its helicopter flight test last summer (AM, Aug. 29, p. 12) at Bell Aircraft Corp.'s Test Division in Fort Worth.



FLIGHT EDITORS of XV-3 approach 45-degree angle and fully in work in conversion



EDITORS, at right, near end of transition from vertical to horizontal



At left, the XV-3 as it will appear in horizontal flight

Missile Guidance by Reeves

IN U.S. NAVY'S FIRST GUIDED MISSILE SHIP

RIS BOSTON, first of the U.S. Navy's guided missile cruisers, highlights modern equipment in the continuing program of guidance systems development in progress at Reeves for the U.S. Navy Bureau of Ordnance.

Equipment installed on the RIS BOSTON, from its successful experience with previous Reeves installations on USS DE LO (DD-774) and USS NORFOLK (DD-961), provides a low height system of continuous guidance control of the ship in its course light path right up to the instant of impact.

Reeves work with the U.S. Navy and U.S. Air Force goes back to the initial stages of this successful missile guidance program. If you're concerned with the planning of your air task orders in the fields of missile or aircraft guidance, radar, radio control, some modernization or complete systems of any type, you should consult Reeves' experience ... and thoroughly experienced ... research, engineering and manufacturing facilities.



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First U.S. Bi-Directional System Will Begin Operation in November

By Glenn Garrison

New York-The nation's first bi-directional instrument runway is scheduled to be in operation at New York International Airport by the end of November, according to the Civil Aeronautics Administration.

Installation of an Instrument Landing System at the southeast end of Idlewild's Runway 4-22 will begin in early summer, and a second approach light system subsequently will be added to the ILS.

Equipping both ends of the runway with ILS will improve the airport's IFR landing capacity and, by reducing the need for circling approaches, should also ease the airport's noise problem. In 1955, bi-directional instrument runways for Idlewild's instrument runway would have allowed an estimated 3,150 landings that were not made possible by the single ILS.

Although New York International will be the first to receive additional ILS, Newark Airport's installation will begin shortly thereafter if CAA budget plans permit. LaGuardia, that airport in the New York regional system, may have a bi-directional instrument runway eventually, but its prospects now seem obscure. (CAA officials will discuss only the Idlewild installation, the only one authorized in the present budget.)

Second ILS Criteria

All three New York airports meet the criteria for second ILS consideration set by CAA's House Hearing Study No. 1, which requires "that the winds and direction of low visibility winds are such that a second ILS would permit 700 or more instrument approach approaches which otherwise could not have been made." Among them, the New York airports could have accommodated about 5,800 additional IFR landings in 1954 by using bi-directional approaches, according to Part of New York Authority estimates.

The effort to acquire second ILS facilities at the New York complex began in 1951, after the CAA's First Region and the Port Authority completed a joint study of air traffic flow through New York. Both agencies agreed that the installations were desirable. It was then up to the Port Authority, in operation of the airports, to find the First Region to accommodate the installations and to pay the needed funds.

From CAA's standpoint there were other problems, too, that had to be

solved before bi-directional approaches could be installed.

At New York International, for example, CAA delayed action pending developments in a second instrument runway project planned at that airport. CAA wanted to test and install the new ILS at the southeast end of the proposed runway, which will be parallel to and near the existing 4-22.

At the moment, however, since the second runway seems set to be an immediate prospect, the second ILS will be used for existing Runway 4-22 and will be moved over when the new runway is built.

Reduced Minimums

Present landing minimums at Idlewild are 300 feet and one-half mile for the southeast approach to 4-22, and 400 feet and one mile for the northeast approach, using the "back course" of that present ILS (which includes the glide path and approach lights). With the new ILS, minimums will be 300 feet and half a mile for either approach.

The Port Authority already had acquired the necessary land for the new ILS installation.

Unexpectedly short on obstacles at the northeast approach to Runway 4-22 at Newark has been a "tree obstacle," says CAA's view, in recommending a second ILS at that airport.

The 285-foot-high "Calico Stack" has obstructed the approach since 4-22 was opened in 1952, and its removal was delayed by long negotiations with the Calico Glass Manufacturers using the site. Lowering the obstacles' maximums would have created a health hazard, while leaving it up prevented even the use of circling approaches from the northeast at Newark. House estimates are 300 feet half of the southeast end, 500 feet and a half from the northeast. Last week, however, estimates to remove the tree stack from the stack and it should be done within the next six months. The Port Authority, with integrated federal aid, is paying 300,000 for the removal job.

Port problems solved, CAA's First Region has recommended the ILS installation to Washington, but national CAA won't say whether there is an item for it in the coming budget.

LaGuardia Approach Problems

The LaGuardia instrument approach installation is costly. The southeast, or instrumented, end of Runway 4-22 (the instrument runway at all three airports was parallel to one other in the

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NEWS OF G-E AIRCRAFT PRODUCTS



Problem: To cut armament system development time

DYNAT—here's the name General Electric gives to its new Dynamic Accuracy Tester which can now evaluate complete airborne armament systems during ground firing under fully simulated flight conditions.

Control readiness of airborne armament systems can be evaluated early, by complete testing, to evaluate flight test—no more way to duplicate actual armament system environmental conditions. This procedure is expensive, time-consuming and gives only a sampling of a system's performance. DYNAT solves that testing problem by simulating on the ground the situations expected in actual combat. In this way DYNAT saves time and money and gives a complete evaluation under all conditions required for combat readiness.

General Electric believes it has the answer to this problem with DYNAT, here's why.

1. Simulates air battles on the ground. DYNAT can be used for complete armament system and component evaluation. It tests the actual radar tracking and aerial gun firing errors while the competing system

is functioning. It consists of a group of units designed to simulate the dual combat times and provide continuous evaluation records of the problems that any armament system meets during the actual duct.

2. Tests effects of own ship's motion. DYNAT tests the effect of the armament system to compensate for its own ship's motion.

3. Radar noise. DYNAT can test the effects of radar noise, either atmospheric, system, or target generated.

4. Shock and vibration testing. DYNAT can test the effects of ship's vibration, shock, and any other random noise that may be encountered in actual flight firing.

5. Weathered effects. Weathered conditions on the armament system with DYNAT can be simulated with weights and shock units, such that the proper load is applied to the weapon for a given angle of firing and condition of flight.

Solution: New G-E DYNAT reduces need for flight test.

6. Complete environmental testing. Installation of DYNAT on G-E's all-weather firing bench permits full firing evaluation at any temperature from -100°F to +180°F.

DYNAT SIMULATES ACTUAL FLIGHT. Every flight condition can be simulated by DYNAT. The fire control system (radar, computer, and gun) as an environment which closely approximates the operational habitat, the effect on the armament system can then be evaluated through DYNAT results can then be checked against those by firing only a fraction of the flight required to permit full only no more tests. The fact that DYNAT can simulate actual flight tests relatively quickly and inexpensively will permit the accumulation of statistical data from a far greater number of simulated actual operations than is currently possible in actual flight testing.

For more information, DYNAT, contact your nearest G-E Apparatus Sales representative, or write for literature GEA-6113, General Electric Company, Section 219-96, River Road, Schenectady, N. Y.



DYNAT simulates various conditions that occur in actual combat and armament system's computer facilities.



Foreground shows General Electric's all-weather firing bench with DYNAT installed. General is in rear control room.

Here's how DYNAT reduces over-all development schedule



DYNAT's ability to reduce evaluation testing time will help to get operational systems in service sooner.

G-E Transformer-Rectifier operates at higher ambient temperatures



Weight of new unit is only 88.5 lbs.

General Electric's latest addition to a new line of transformer-rectifiers is model GEA-7422. Weighing only 88.5 pounds, it is actually below the demands of MIL-STD-1212 requirements. It operates without derating up to 50,000 ft. at 20°C, or at sea

level up to 110°C. A 5 KW unregulated unit for most electronic applications has the least developed, weighing 32.1 lbs. and a new design of a 12 amp (100 lbs.) unit has been completed.

OTHER DESIGNS AVAILABLE.

Many designs are available along with application engineering services on new and very special units, including units without loads in tracking systems which can be utilized with short coupling furnished. Silver-oxide battery charging units have been made on the 200 amp regulated units, and test systems are available on request.

Learn G-E development facilities that can

35 lbs., 100 amp unregulated unit is now possible (MIL-STD-1212), and a 35 lb., 200 amp regulated unit is on the immediate future. To reduce weight of regulated units, new circuit developments are being investigated such as the use of more diode reference current and amplifiers. Use of silicon based units renders a major study.

General Electric has done previous work in reducing size and weight of regulated and unregulated electronic power supplies. Check your nearest G-E Apparatus Sales representative for further information, or write for literature GEA-6113. Section 219-96, General Electric Co., Schenectady, N. Y.

New servo motor operating on B-47

Developed as part of a servo mechanism in the gun directional computer system for the B-47, General Electric's new miniature 4½ inch motor is but 1½ inches in diameter. Weighing 8 ounces, it operates equally well at sea level or at 50,000 ft. provided the ambient air already is at the lower end of the temperature range as stated in the general motor specifications.

DESIGNED FOR THESE APPLICATIONS

The new motor is designed to meet the most of the military specifications MIL-STD-8000 (ASG), and the various service level conditions of the open for short periods of time. It can be used as a power motor in a gun directional computer system, as electronic device, and can be modified for other aircraft and missile applications requiring a considerable number capable of giving a high speed of response. It can also be geared to very low speeds where applications dictate.

NEW MOTOR HAS THREE FEATURES

Rated at 6000 hp at 6000 rpm, the new,

miniature 4½ inch motor is built with flexible packaging and pole pieces to meet the rapid flexibility requirements in given the speed. Because it is not restricted to any one type of operation, but has the advantages of a small size control and good efficiency.

one as applications where small power output are required.

For further information on this new motor check your nearest G-E Apparatus Sales representative or write for literature GEA-6113, Section 219-96, General Electric Co., Schenectady, New York.



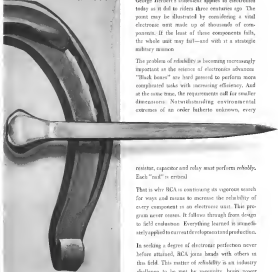
B-47 servo motor is used in B-47 gun directional computer system.



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*For want of a nail the shoe is lost,
for want of a shoe the horse is lost,
for want of a horse the rider is lost.*

George Herbert's statement applies to electronics today as it did to riders three centuries ago. The point may be illustrated by considering a wind electronic unit made up of thousands of components. If the least of these components fails, the whole unit may fail—and with it a strategic military mission.

The problem of reliability is becoming increasingly important as the science of electronics advances. "Black boxes" are hard pressed to perform more complicated tasks with increasing efficiency. And at the same time, the requirements call for smaller dimensions. Notwithstanding environmental extremes of an order hitherto unknown, every

resistor, capacitor and relay must perform reliably. Each "and" is critical.

That is why RCA is continuing its vigorous search for ways and means to increase the reliability of every component in an electronic unit. This program never ceases. It follows through from design to field endurance. Everything learned is immediately applied to current development and production.

In seeking a degree of electronic perfection never before attained, RCA joins hands with others in this field. This matter of reliability is an industry challenge to be met by ingenuity, brain power and engineering knowledge wherever it is found.

Sperry Sharpens New Executive Tool

By Henry Kiefer

Grant Noid, N. Y.—Sperry Gyroscope Co. is devising a new weapon to throw into the continuing struggle to reduce the cost of arms and give the Government more for its defense dollar.

Current plans for the weapon—the application of data-processing techniques to the problem of top executive management—include setting up a system of non-scientific armament control based on the latest "operations research" or other mathematical management formulas.

Operations research, a fairly new and fast expanding field, hopes to find the solution to highly complex management operational problems through the use of such tools as statistical and probability techniques, mathematical analogs representing physical situations or application of some theory and the feedback concept.

Industry, however, could never have considered the wide use of these tools before the development of the high speed computer which made it possible now to solve in days or hours complexities that would have required years or months by old mathematical methods.

Feed-Back Concept

The feed-back concept is basic to many electronic systems and to information that, fed back into the system, automatically controls future operation to achieve a fixed objective.

Sperry's experience in the creation of feed back systems has made the company especially aware that the value of guidance data gained can be there because it is no better than the factors and programming involved in it. As with high speed "electronic" lenses and computers, the results can be analyzed if the input data is inaccurate or incomplete.

So, as the first step before instituting the new data processing technique, the company now the need for sharpening up the ability of its operating managers to correctly evaluate the data before affecting executive decisions. This sharpening phase took the form of a five-day seminar for 15 Sperry divisional managers on applying the principles and formulas of operations research to inventory control.

The seminar was conducted by Paul Loken J. De Rose, training and manage-

ment consultant, and head of the Department of Management at Fordham University.

Top-Level Approach

The top-level approach makes the program unique. Sperry believes, in that it introduces the control factor of management judgment as a first step before the selection and programming of suitable data, and that it attempts to apply these new formulas into the top down instead of the bottom up, as is the normal computer solution of statistical problems. De Rose, who has conducted inventory control for the Armament Industry Data and a number of leading major companies, believes that the Sperry seminar made the first time in armament industry that this approach has been used on such a high management level.

Reports from the line executives, nothing suggested techniques for more effective handling of inventory, are now being reshaped. Many of the reports call for the use of computer formulas, with appropriate modifications to fit the variables of military production, as an aid to decision making.

Why Inventory Control

Sperry chose to kick off the program with inventory control for several reasons.

• **Forecasting efforts.** It presents across-the-board considerations, affecting engineering, production, cost control, purchasing, accounting, field service, ad-

ministration, planning, sales and other activities.

• **Economics.** The effect of economics introduced at the executive level is an aid to the line. One dollar saved here is equivalent to 10 dollars in additional sales the division managers were told. Thus, Sperry sees its individual ten-dollar inventory as a promising source of important financial tools for the company and its client customers, the Government.

• **Flexible mobility.** Gen. Edwin W. Renshaw, chief of the Air Materiel Command, has said: "Logistics is the muscle of striking power, as strategy is the brain." Inventory control, De Rose points out, is one of the nervous management through the logistics muscle. It helps to give an organization—military or industrial—flexible mobility, which is more important in the armament age than the mass stockpiling of weapons and supporting equipment, according to Gen. Renshaw.

General and Specific

In the seminar sessions, De Rose showed how Sperry's executive control problems could be broken down into separate marketable parts, with each part separately analyzed. Then, at a final session the managers packed up De Rose's theoretical outline and suggested modifications to make it fit the company's specific problems.

Inventory, De Rose pointed out, is



GIVE AND TAKE—Sperry division managers at seminar discuss a point with problems.



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INVENTORY CONTROL FORMULA shows how each of manufacturing and shipping must be compared to get best final unit.

can, instead, work in pieces—equipment or finished parts and finished products held in storage, awaiting use, or in the process of being manufactured.

To control inventory, the establishment and maintenance of a store of material and parts capable of meeting immediate demands to a production plan based on sales requirements and of the least possible amount cost.

Then inventory control involves the determination of inventory quantity standards, establishment of an adequate control system, checking of physical quantities against records, reducing of waste through salvage operations, and the handling of stock efficiently. In which items must be examined with regard to their value, or define their usage and their exposure to such risks as order cancellations and expiring change.

Conflicting Considerations

In order to arrive at the lowest unit metric cost, it is necessary to consider:

- Cost of obtaining material in order and replacing production and purchased materials.
- Cost of maintaining, reflecting the establishment, carrying and protecting of the inventory.
- Cost of being out of stock, reflecting the price, direct and indirect, necessary to meet per for not having stock when required.

These factors generally conflict. For example, if the company considers that it will need 1,000 units of a specific item for various purposes during the year, the amount and cost of obtaining this quantity would be when the item should be purchased is reduced at the time. Furthermore, the company must it will have the item when needed.

However, this will mean very high inventory costs—items held up in stock, space tied up in warehousing, possible loan losses due to obsolescence and expiring changes. Thus, the costs of maintaining the stock go

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up is the quantity ordered each time goes up.

A simple formula defining the "recommended order quantity," which has arisen out of extensive experience with this problem, is one of the tools available for dealing with inventory. De Rose and Once top management has properly accepted the status of the inventory, lower education has a single guide which enables them to make decisions, decisions without constantly taking up management's time on these problems. The formula is:

EOQ =
 $\sqrt{\frac{2 \times \text{Annual Demand} \times \text{Unit Price}}{\text{Carrying Cost per Unit}}}$

In order to use the formula properly, management must first factor into the formula its own experience.

Reducing the Inventory

De Rose suggested that being to maintain inventory at 30% led to increase the cost of being out of stock, creates a promising proposition — on basis of an inventory at the first stage — in an excess of detail parts in an excess of sub-assemblies, and so on, with each stage corresponding the excess of previous stages. He suggested that management instead might give stock item protection in slow or longer lead times for high or in various stages, or unpredictable quantities. Thus, management might protect itself by setting up a schedule permit for incremental production above or below stock requirements.

Management may be carrying a high inventory of slow-moving sales in product stock as "insurance" against and less demand. Analysis of the stock item, slow the possibility of moving the inventory back to an earlier stage of assembly. De Rose and accepting sub-part concerns to ensure products which does close to the finished stage. This would provide a final design to draw against at least cost find a similar course at a rate, or varied stage.

Another major contributor to high inventory costs is a lack of adequate standardization. De Rose said "The problem can be attacked positively from the bottom up starting with the simplest part and both by reducing the number of types, inventory requirements can be cut considerably."

Manager's Viewpoint

A more careful scrutiny of engineering changes, balancing the economic cost against the expected performance improvements, would cut down on as various problems in reducing the amount of stock that is made obsolescent by these changes, De Rose said.

In the past decade of the firms

concern following De Rose's presentation the division manager generally felt into three categories:

- Staffs the inventory situation to get exact data on what is done, and what needs to be done, and attempts to correct existing viewpoints.
- Inform top management of the problems and education for the working level, and present suggestions for their solution.
- Get from top management working parties and representatives to implement the solution.
- Set up procedures and an organization, either part-time or full-time, with responsibility for day-to-day administration of the problem.
- Improve communication and prevent "blame" of changes between departments.
- Sell program to lower echelons.

The reports from the individual managers after consultation with De Rose's office, will be circulated for comment before final implementation, De Rose said.

Industry Interest

The month completed seminar in De Rose's second such project for Sperry. A previous training course was held by Sperry's personnel. Other De Rose clients in the aviation industry include: Hercules Standard Division of United Aircraft Corp., Bendix Aviation Corp., Cessna/Wright Westinghouse, General Electric, and Canadian.

Starting in 1953, De Rose conducted a course on aircraft buying for the Air Force Industries Association. In these workshops extending over a period of two years, eleven were held for a total of more than 100 participants and many industry executives and scientists from the Air Force, Bureau of Aeronautics and the aircraft industry.

De Rose is also a member of the American Aviation Association and is a permanent arbitrator in several labor union contracts. His offices are in New York.

University Offers Summer Course in Air Safety

Los Angeles—The flight safety program offered military pilots at the University of Southern California has proven so successful that a short course is being made available to civilian personnel.

The course is scheduled for July 25 to Aug. 7, 1956, and will deal with techniques of investigating crashes and with how aircraft accidents to determine cause factors, according to Dr. Louis Kaplan, Coordinator of Flight Safety Training at USC. Preparation of accident reports also will be included.

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PRODUCTION



RISING SUN SMELTEN (top) over Japan on wings of T-33 jet trainer (left) assembled by the Kawasaki Aircraft Corp. Picture at right shows U. S. technicians from Lockheed instructing Japanese engineers in assembly methods for the T-33.

Japan Assembles T-33, Enters Jet Age

By Don Knauss

Tokyo—Japan successfully tested its first postwar domestically assembled jet aircraft on and Japan, entering a new age, are Japanese aviation.

The plane was the first of 180 T-33s scheduled for assembly and eventual manufacture in Japan by June 1958 for use by the growing Japanese Air Defense Force.

Powering this comeback of Japan's aircraft industry is the Kawasaki Aircraft Co., which is putting together the T-33 airplanes with technical aid from Lockheed Aircraft.

According to Lockheed technicians, the Japanese firm is doing a remarkable job. The 530 Kawasaki employees working on the project are reporting an 80% learning curve.

Only 4,800 machines were adopted to assemble the first T-33—1,200 less than the original estimate. And the quality of their work was reflected in the flight tests, which revealed only very minor faults in the finished product, although Kawasaki had been able to do

little post-flight ground testing because of the lack of equipment.

"Once these Japanese learn what to do, they do it as well as better than most American technicians. Lockheed's technical superintendent, Michael Cramer, told *Aviation Week*.

The one American complaint lies in the fact that the Japanese tend to copy their airplanes literally. Unlike U. S. workers, they seldom question orders given them, even if they know those orders may be faulty. That the U. S. engineers at Kawasaki say, they must be double careful to give instructions 100% correct all the time.

To Build 180 T-33s

Kawasaki is to turn out 180 planes by June 1957. The total cost of about \$12.6 million for this first segment of the program will be divided between the U. S. and Japanese governments, the former providing around \$11.4 million, or 70%, and the latter, \$7.2 million, or 30%.

The U. S. share will cover technical aid, licensing expenses and all costs in

connection with the production and handling of parts until they are loaded on Japanese ships at the port of Los Angeles.

Japan will pay all subsequent costs, including ocean transportation, assembly and flight testing.

A second agreement, soon to be concluded, provides that Kawasaki will produce another 60 aircraft from July 1957 to June 1958. The percentage each country will pay will probably be reversed under this second. For its native capacity to manufacture parts overseas, American shipments will decrease accordingly.

Kawasaki's T-33 production schedule for 1958 calls for one each in January, February and March, two each in April and May, three each in June and July, five each in August, September and October, six in November, eight in December. The schedule for 1957 calls for January, 10 each in February, March, April, May and June.

Three of those scheduled for completion in June 1957, however, may be carried over to the second program start

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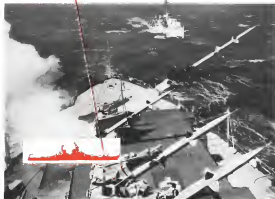
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and specialists on file, is in using and recombination system in national light production, right in tool structure, being, and plant engineering, seven in manufacturing and industrial engineering, and 10 in quality engineering.

These men are guiding a Kawasaki working firm, at about 198, which will grow to 2,000 by the end of 1970. The Japanese do not issue advice to the service directly. Each needs through a Japanese counterpart who directs the work to be done what to do.

Other Licenses in Progress

Lockheed is providing Kawasaki with additional technical and manufacturing knowledge parts from its main manufacturing plant and obtaining other equipment from subcontractors in the U.S. It is also arranging licensing contracts between American manufacturers of parts and Japanese firms.

Up to now, Honda Instruments has licensed Tokyo Radio Science Co. to produce, test, and bank radiation acceleration electron stations and export beam controls. Matsushita Electric Works, antenna transmission and induction, magnetic transmitters and induction, and instruments using this equipment, including fuel flow meter components. Shinoda Electric Co. reverse current valve, voltage regulator and control panel. Kasei Kogyo KK, wire which, wire which, handle hydraulic cables and controls, Yokogawa Electric Works, jet turbine ignition magnet, receiving capacitors, mag-

nets shielding and harnesses, and ignitor harness.

Convair Electric Co. has licensed Japan Aviation Electronics to manufacture Convair plant. An agreement between the B. F. Goodrich Co. and Yakukawa Rubber Co. for the production of fuel cells is now pending. Other records are also being negotiated at present.

However, difficulties in concluding many of the anticipated contracts was considerably slow down plans for a gradual switch to Japanese-made parts.

New Production Facilities

So far, research has been done under makeshift conditions in old inadequate buildings at Kawasaki City plant. But this company is now spending \$4 million on new production facilities that will be ready for use by next April. About \$30,000 is being spent for land, \$951,000 for building (including new structure, reconstruction, expansion, and removal), \$1,100,000 for new electricity, \$1,400,000 for gas and tools, and \$400,000 for other items. In addition, operation costs will run to \$2 million.

An aircraft plant with a floor space of 175,000 sq. ft. is almost completed and quarters for Lockheed engineers—28 furnished cottages—have already been built. New old buildings, until now used for airplane manufacturing, lightplane production and assembly of the first T-33s are being fitted out for parts manufacture. This floor space



KC-135 Section by Rail

One of the largest freight sections ever to be moved by rail arrived recently at Boeing Airplane Co.'s Renton, Wash., plant after a custom, one-day journey from San Diego where it was constructed by Ryan Aeronautical Co. under a Boeing subcontract. The section will become part of the first production model of the KC-135 jet tanker being built for USAF.

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turbine 215,000 sq. ft. Machinery being installed, mostly Japanese-made, includes also an open rolling machine and stretch press.

To meet these expenses, Kawasaki will use \$1.4 million of its own capital and hopes to obtain \$1.2 million in Mutual Security Administration funds and \$100,000 in long-term credit bank loans. City bank loans will be allocated to meet equipment expenses.

Kobe Industry

The T-33 project will have significant effect on Kawasaki's growth. The closing of the pre-war Kawasaki Aircraft Industries Co., which 50,000 employees turned out military aircraft during the war, the first increased its capitalization from \$2,451,800 to \$4,566,000 in November 1955 about a month after the T-33 program got underway.

Building equipment now working on this project, Kawasaki has a labor force of more than 5,000 workers, divided between its Gifu and Kobe manufacturing divisions.

In addition to new facilities being added for the T-33 program, Gifu has a total area of 916,000 sq. ft., a floor space of 473,000 sq. ft., and machinery worth more than \$1,100. Kawasaki has produced here the K-11 line in 1951 and K-11 line in 1952, as well as target aircraft for the Japanese air force, and the K-13 trainer for civilian aviation schools. Also, airplanes for the U.S. and Japanese air forces are produced here (157 in 1955). In addition, Kawasaki manufactures about 700 km bodies yearly at Gifu.

The Kobe site has a total area of 916,000 sq. ft., including floor space of 149,000 sq. ft., and machinery valued at 1,000 units. Kawasaki-Kobe built the B-67 47 helicopter (5 in 1954, 14 in 1955, 24 in 1956). Japan's only facilities for the complete overhaul of jet engines (15 in 1955) are also located at Kobe.

Over \$2 million was spent in 1954-55 installing these facilities. The company has manufactured 240 jet aircraft engines here, as well as turbine engines, precision gears, shafts, propellers and small engines.

The Profit Picture

The T-33 program will greatly enhance the company's activities—and financial standing. Its annual profit from the program is likely to be from \$ to \$100.

Under the U.S.-Japanese agreement, the price of the T-33 airplane, based on the average of the first 100 planes, has been pegged at \$172,000. Of this amount, \$44,000 will be borne by the U.S.

When the actual purchasing price is paid by Japan's Defense Agency, it will be \$75,000. Kawasaki, however,



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HELICOPTER MEDICAL MISSION CROSSES AFRICA—Crossing African jungles and bushland from Leopoldville, Belgian Congo, to Nairobi, Kenya, the Ladovle-Sikorsky Medical Expedition flew 2800 miles in a Sikorsky S-55, distributing drugs and surveying health conditions. The expedition again showed the significant role of the heli-

copter in public health work in Africa. For several years Sikorsky helicopters have been used there in spraying operations to control the tsetse fly, carrier of sleeping sickness, and for other vital health missions. The helicopter's ability to reach inaccessible areas opens new possibilities for the development of equatorial Africa.

AROUND THE WORLD WITH SIKORSKY HELICOPTERS



TO THE ANTARCTIC—Landing on the Coast Guard icebreaker *Eastwind*, a Navy Sikorsky HO4S helicopter joins Operation Highsway, the U. S. antarctic expedition. The *Eastwind* sailed from Boston in November. The HO4S is a Navy version of the famed S-55 which serves in quantity in each of the U. S. armed services and is the standby in commercial and military operations all over the free world.



S-55s FOR COMMERCIAL SERVICE—To enter airline service in the U. S. and Europe in 1956, the Sikorsky S-55 is the largest helicopter made available for commercial service. New York Airways plans to buy 7, Sabena Belgian World Airlines 8, all to be delivered starting in the spring. Both airlines currently use S-55s. The new S-55 will carry 12 passengers and will cruise at more than 100 m.p.h. against the earlier model's 85 m.p.h.



HELICOPTER HISTORY



FIRST SHIPBOARD LANDING

In May, 1943, Capt. (now Brig. Gen.) H. Franklin Gregory landed a Sikorsky HO4 on the deck of the tender U.S. *Buckler III*, as a successful demonstration of a helicopter's ability to operate from the small deck of a merchant vessel. The demonstration took place on Long Island Sound off Queenscliff.

THE MARINES HAVE LANDED—this time, by helicopter, landing on a submarine. And the situation is well in hand, with this unique operation again demonstrating the helicopter's versatility, offering new methods of evacuation for the sick and wounded and new possibilities for emergency supply, as well as new logistic capabilities. Photo shows a Sikorsky HO4S-4 transport helicopter landing aboard the 1586-ton *USS* during exercises off North Carolina. The HO4S-4 is the Marine Corps version of the Sikorsky S-55 helicopter, which is also operated by the other armed forces.



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wants to raise the price to about \$54,000, but will probably settle for about \$53,000.

In any case, the important effect of the T-55 project on Kawasaki's financial position is reflected in the following projections:

Since April 1955-March 1956, sales of \$7.6 million and profits of \$168,806, the company expects to close its sales of \$14.7 million and profits of a little over \$1 million in the year April 1956-March 1957. For the half-year, April-September 1957, the company expects sales of \$5.6 million and a profit of close to \$700,000.

Not calculated in these figures is the business Kawasaki will do if several prospective jet equipment manufacturing projects get underway as planned. Under a \$20-million program now being considered in Washington, Kawasaki, with technical assistance from the Allison Division of General Motors supplied through Lockheed, would manufacture 350 J51 jet engines over a five-year period starting next September for (Shikoku) Heavy Industries would produce J57 jet engines with General Electric Co.'s technical aid in a \$10-million five-year venture beginning in April 1958.)

Moreover, Kawasaki, together with their other Japanese aircraft companies, is now developing an intermediate jet trainer for the Japanese Air Defense Force. If its model is selected for mass production, a decision is slated to be reached this spring—it will obtain sizable orders for the LM-9. Furthermore, wind tunnel tests have already been made.

Finally, Kawasaki and Lockheed are already thinking of producing F-104 fighter bombers in Japan where the demand for T-16s tends to taper off, probably in 1958.

PRODUCTION BRIEFING

Contract for \$1.5 million has been awarded Bosch Aircraft Corp., Waltham, by Lockheed Aircraft Corp. for T7V Navy jet trainer wings. The single aircraft order will extend Bosch production to October 1957.

Plant plant best tooling and fabrication facilities have been established by Metallurgical Consultants, Inc., 4431 E. Slonow Ave., Minnow, Calif. New facilities opened by the firm, organized two and a half years ago, cover over 5,000 sq. ft.

Mixed-bed active moths system will be headed by a new senior department of Research Division, Better Polder Co., Pearl River, N. Y.

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The new Center represents another important step in the integration of Pacific Division's engineering and development skills under the Weapons Systems Concept.



NO. 1 OF A SEVEN



1st engine and engine plants, and all so many new General Motors and American machine tools. With the definite changes in type of manufacture that are coming along, this is likely to become self-evident.

In spite of not being significant in the jet turbine field for the first five years after the War, America has made great strides and is now fairly close on our heels, and I attribute this almost entirely to the great benefit that has resulted from adequate research equipment based on what is seen in Germany immediately after the War.

Vacuum and change of policy has put back our timing, and left only a few years to catch up.

The tremendous pull that the U. S. A. has put through on experimental and prototype engine building is extremely serious. The advantages that accrue to these engine industries, in leaving the United States behind at Cleveland for testing the latest engines in the Mach No. range of 2 to 3.5 without an air war, are obvious with research in of enormous advantage.

Our Government is holding this matter but in the defense area, and it is anticipated that we can have in time some more equipment comparable with what the U. S. A. possesses today.

It is good to know that one British firm has taken on the responsibility of their own engine aircraft interest, and will be much at least a couple of years before the official equipment is ready. In the meantime, other countries are planning even more advanced equipment.

Wind-Tunnels: U.K. v. U.S.

Similar remarks must be applied to aircraft wind tunnel equipment, although new interests are planned by the Government, it is doubtful if they are extensive enough in the high Mach No. range, and this is nothing even thought of corresponding to the two United States tunnels at Langley and Ames Laboratories in U. S. A. which offer superb facilities for construction to obtain comprehensive measurements on large scale models without in any way interfering with basic research. Here again, it is difficult to put into words exactly the advantages that will accrue over the next few years as a result of these U. S. A. tunnels.

Cleveland and Ames Laboratories are available to the U. S. A. (General Agreement) Secord's delegates' suggestion last summer. No account is there concerned has been taken of the comprehensive facilities of the U. S. A. at Langley and the U. S. Naval facilities at West Virginia.

In this context, we are at present

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very cramped by our inability to make the high quality supersonic models required for this advanced work, and this again is a serious "bottleneck." These models are at present taking the best part of a year to make and little can be done on the scale stage of custom efforts until the needed tools are functioning.

It is felt that some designers and a number of Government officials are not yet realistic about this matter, and that someone, in the background, there is the old hope that has been hovering on for so long as this country that we can get by without this class of equipment.

'Badly Handled'

It is hoped how badly this whole question of engine and airframe tools has been handled since the War. Finally, in referring that they were not accurate at all, and then when at last the facts became apparent, bent over on the right path to adjust and do steps that would have to be taken to meet anything like the required standard program. We are a long way from being out of the wood yet on these vital matters.

It is tremendous progress to see the models and designs that are the required tools facilities such as that at Edwards Base. Work modern engines some aircraft, which we put around the corner, it is quite wrong to ask test pilots to do development of new projects on certain aerodynamics of home.

The attitude to see North Africa here is far from an altogether adequate stopgap and the whole matter requires looking on as entirely different and more realistic basis.

'Clamp' Instruments

Not all our test pilots have the technical education and subsequent training necessary to deal with ground-level problems, some of the finest performance departments are inadequate for formulating proper flight test programs and among those carried out. You must actually have left the frame in street view, for the time being, look to be found accurately working in their first flight by engine pilots.

Our aircraft instruments are clean and better compared with those of the U. S. A. Admittedly, there is more opportunity in a greater home market in America with, of course, more competition, but our instrument makers appear too often to meet and take excessive guidance from M. G. S. (Mitsubishi, of Japan) and A. E. (The Aircraft Establishment, Farnborough) instead of going ahead on their own and keeping in touch with American technique and development.

I understand a committee has been sitting for about five years to decide

whether we should have a home-made press or not, an absolute necessity for the new integral spraying tooling. I believe the members of the committee that have been standing in the way, the aircraft construction, who have argued amongst themselves as to whether this is the right way to make aircraft or not.

Search, here is a case where we just could not get going by going ahead on our long-term heavy press for a number of superconductors, which indeed are possible doubt will be required. I gather that at last the aircraft speed is no longer second to thinking that want a press, but it must not be more than 25,000 tons.

'Irresolute' Approach

After this long debate, however, I should say one of at least 10,000 tons was necessary, seeing that it takes several tons to construct, and in most of what I have seen in the States.

This necessary irreolute approach of our industry on this matter reminds me somewhat of the severe criticism some 30 years ago on our passenger seat on dogged attitudes leads and to legal wrangling during the years of superconductors and the fact that in U. S. A. all leads went out. The same lagging has been obligatory, on large high efficiency piston engines and in U. S. A. today the most modern design and integral tooling technique is somewhere used on the margin of all language foreigner transports.

Industry's Responsibility

I feel that the R. A. S. which is composed almost entirely of technologists from engineers, and the scientific members of the Government has caused a great opportunity since the War in not giving their attention to the leadership and guidance to prepare them for the new branch of aircraft technology at war, and will see the Secretary's duty to take the lead in our reaction with all matters relating to technical education and problems relating to technologists in aerodynamics, and to see how much we have learned from our forces can be transferred and used in a better and more practical way.

Turning now to the responsibility of industry. I feel the S. B. A. C. (Society of British Aircraft Constructors, Ltd.) has failed to appreciate fundamentally the great change that has come about in aircraft technique, and to see how much we have learned from our forces can be transferred and used in a better and more practical way.

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Fiat Fighter

Latest model of the Fiat G-91 light ground-attack fighter now under development by the North Atlantic Treaty Organization shows the similarity between the Italian design and the North American F-104 being built under license in that form. The G-91 is being designed by a Fiat company team under Prof. Corbelli. For export to the G-91 will be the Breda Olympia, now running near the 5,000th flight test, as tests. G-91 is competitive with two Finnish designs, the Rogent Hawk and the Dracut Mikko 22 series.

which are appreciation of its professional changes that have come about, and the need for different tactics.

Over this difficult post-war time I had hoped that the R. A. S. and the S. B. A. C. might have more closely joined forces, and I was surprised to see that in the excellent new J. A. S. (Institute of The Aeronautical Sciences, Inc.) block of buildings at Los Angeles the trade union had their own offices and were doing in touch with their technical counterparts to a very marked degree.

Brander Set-up

Indirectly, of course, has its many difficulties and problems, and the S. B. A. C. in its 19 years or so of life has been effectively organized as a successful trade body, but I think it has got to become a broader and more responsible entity than is at present. It is not going to get the new type of British aircraft planned, designed and produced, to enable this country to have a strong enough air defense force and a reasonable share of the world's aviation business.

Perhaps, the industry was a much smaller situation, and be back as we think it was possible both to "take in" such other "making" and to have enough work to keep many thousands of men and women going. I suggest that the greater complexity of post-war aircraft technique may have extended this procedure altogether, and that one of the chief problems of the S. B. A. C. is that while it is serving its members

the way they think they ought to go that much deeper than set the ball rolling.

(This is the third in a series of four articles in which American World is reporting the speech made by the Rev. Father John D. O'Connell at the North Atlantic Treaty Organization's 1964 Conference on Problems of Aircraft Production. Dr. O'Connell was invited to the conference by the Secretary of the North Atlantic Treaty Organization.)

Forging Development Eases Titanium Blade Problems

A new titanium forging process, used to make it possible to produce finished pieces of blades at cheaply as rough forgings, has been developed by Canadian Steel Corporation.

The new technique is based on work done by a sister firm, Gossard Engine Ltd., in developing a superalloy solution to the company's Canada turbine engines. CSE reports the new process to autonomous production of the casting quantities of superalloy jet engines by increasing the hours to economic use of titanium.

Details are guarded, but it is believed that the new process overcomes the usual problems of titanium production such as chemical efforts that hydrogen and nitrogen which cause the metal to become brittle, and to scale, and other results in distortion during forging of thin sections.

U. S. manufacturers have already ordered the new titanium turbine blades.

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A3D IN MACHINERY HOUSE Sliding door door door during engine run-up.



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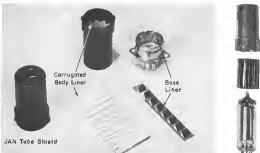
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NEW LOW-COST inserts for JAN tube shields, developed by Collins Radio (left) and by the Navy Electronics Laboratory (right), reduce temperatures by 50%.

New Shield Insert Reduces Tube Heat

By Philip J. Kline

Tube failures in existing avionics equipment can be reduced by a simple new device now coming on the market. The new, a corrugated metal liner that can be inserted quickly in a standard envelope, JAN (Joint Army-Navy) tube shield, reduces tube operating temperatures by as much as 50%.

The new liners are going into much of the Navy's existing electronic gear and may be made available for all existing military equipment within six months.

The liners are presently available in two model versions developed by the Navy Electronics Laboratory at San Diego, the other by Collins Radio Co.

The NEL-type insert is, in effect, a heat sink, made from a number of components, including Atlas E-R Corp., Bantam Corp., Cushman Manufacturing Co. and International Electronic Research Corp. (IERC).

Collins plans to market a complete JAN-type shield equipped with inserts and, so far, has not licensed any other firm to its design.

Provides Conduction Path

A conventional JAN shield traps a layer of insulating air between the tube's glass envelope and the shield and provides no direct conduction path for getting rid of tube heat. When the NEL, or Collins liner is inserted on the shield, it grips the tube, providing a direct conduction path to the shield and through the shield base to the avionics.

The most significant difference between the NEL and Collins designs is that the latter uses both an insert for the shield and another one for the shield base (see photo above). Collins tests indicate that the new liner drops the temperature of the lower portion of the tube glass envelope by 5-10 degrees Centigrade.

The Collins shield insert is made of heat-treated high-tensile copper and silver, to provide both resistance and good con-

ductivity. The NEL-type liner is made of 0.005-in. brass shim stock, and also gives a nickel-calcium plate finish.

Better, But Not Best

NEL tests indicate, that the new inserts do not drop tube temperatures as much as the best dissipating shield made by IERC (AW Dec. 18, 1955, p. 62). This one, adopted by the USAF (Type B), is being considered for adoption as a MIL-Standard for use in new equipment.

The IERC Type B shield provides convection cooling in addition to a better conduction path from the shield to its base. However, it is not deservingly unobtainable, with JAN shields on existing equipment, because of its special base.

NEL is therefore recommending that all new equipment under development should use the IERC Type B shield, but that all existing equipment, now in service, should be equipped with the new liners. IERC recently brought out a modification version of this shield, called Type A, which can be used in a direct JAN shield replacement, making it suitable for retrofit. It is less efficient in heat dissipation than the original Type B.

Reliability Pay-Off

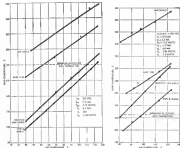
Protest evidence that the new shield liners pay off in much improved tube reliability is cited by Collins' H. M. Parsons. For instance:

- 90% decrease in annual rate of Type 5005 tubes reported for 2,400 hours in room temperature ambient (21°C). Below that maximum plate dissipation rating. After 2,000 hours, with 10% of the tubes equipped with conventional shields (AN shield) and 90% of the tubes equipped with a Collins shield and base liner was still operating satisfactorily. Maximum hot spot temperature was reduced from 306°C to 290°C, after six months.
- 100% of Type 5024 tubes equipped with Collins liners survived 200-hour operation in the radio rack of a conventional aircraft. In 50°C ambient, whereas only 94% of the same tubes without liners lasted through the same 200-hour run.

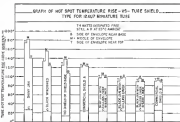
Test Results Differ Slightly

NEL and Collins have run extensive tests to check the effectiveness of their respective shield liners against other shield configurations. Although both tests offer proof that the new liners are extremely effective, the differences in the design of equipment subjected—probably the result of slightly different test set-ups and procedures.

NEL ran tests on a number of different miniature tube types, comparing tube hot-spot temperatures with JAN,



NAVY TESTS showed lower temperatures on Type 5014A 3, 6005 (a) tube temperatures

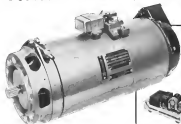


COOLING RESULTS show both hot-spot temperatures rise of variety of shield configurations.



COLLINS tested various shields, equipped by plastic buffers, on electronic chassis

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100-4	200	28.0	714.3	60.0	40.0
100-5	250	28.0	892.9	75.0	50.0
100-6	300	28.0	1071.4	90.0	60.0
100-7	350	28.0	1250.0	105.0	70.0
100-8	400	28.0	1428.6	120.0	80.0
100-9	450	28.0	1607.1	135.0	90.0
100-10	500	28.0	1785.7	150.0	100.0
100-11	550	28.0	1964.3	165.0	110.0
100-12	600	28.0	2142.9	180.0	120.0
100-13	650	28.0	2321.4	195.0	130.0
100-14	700	28.0	2500.0	210.0	140.0
100-15	750	28.0	2678.6	225.0	150.0
100-16	800	28.0	2857.1	240.0	160.0
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Thermocouples were selected at three locations on tube to check temperature.

large-capacity JAN, USAF Type B shields, and with no shield.

Calder checked a large variety of shield combinations, including those JAN, black JAN with shields in a down, down JAN with Calder heat and heat shield, black JAN with shield heat only, black JAN with shield heat and heat shield and the two IERC shields. In its test results, Calder identifies the IERC (Type B) shield as "Commercial Type B," and the more recent IERC JAN replacement as "Commercial Type A."

NEL Test Results

Tests at NEL revealed that whereas a conventional JAN shield shows considerable spot operating temperatures above that of a bare shieldless tube, the addition of an NEL heat drops the temperature appreciably below that of a bare tube.

In some instances, depending upon the tube type, its power dissipation and whether it normally operates at a very high temperature, the temperature is higher achieved by the NEL heat shield approach than obtainable with the IERC Type B. In other cases the IERC Type B is expected to offer appreciable further reduction in tube temperature.

NEL tests on Type 91A4 tube equipped with a glass thermocouple at 275 watts per plate, in a surrounding air temperature of 70°C, had a maximum hot-spot temperature mean of:

- 150°C with a JAN shield.
- 120°C with no shield.
- 75°C with standard-equipped JAN shield.
- 60°C with IERC Type B shield.

But by merely mounting the NEL heat shield on the hot spot temperature rose was slashed approximately 50%. The advantage of the IERC Type B is

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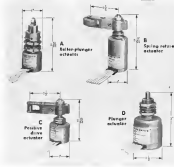
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MICRO precision switches

...THEIR USE IS A PRINCIPLE OF GOOD DESIGN



These small, completely sealed, cylindrical switches provide unusual design flexibility

Here are four examples of a family of MICRO SWITCH environmental proof switches that provide unusual flexibility for control designers. With these MICRO SWITCH actuators an extremely new concept in miniature switches. The switches are small, non-plastic, cylindrical, rugged, and of high structural integrity. They are ideal for use in loading guns, doors and other exposed locations. They are equal in performance and have some versatility of application that switches cannot have from their size and weight.

The switches are sealed so that operating characteristics are unaffected by oil vapors, atmospheric pressure, humidity or any in-purities. The enclosing chamber within the housing is evacuated, then filled with dry inert gas and sealed. This prevents any effect of atmospheric changes such as "breathin" or collection of moisture within the switch chamber. The actuator operates through a seal which keeps dirt or moisture from entering. Plunger-type switches have an air-seal ring.

The switches are designed for bracket type, or through-hole mounting. Leads are supplied, one for each terminal, the number depending on contact arrange-

ments and terminals. The leads project at a 90 degree angle from the base of the switch. They may be in any direction by rotating the switch on its axis. The switch type designated as (a) has a roller-plunger actuator for activation by cam or slider; (b) has a spring return actuator also for use as slide operation; (c) has a positive drive actuator for linkage operation; the type designated as (d) is designed with a plunger actuator for in-line motion operation.

For complete information on these new cylindrical miniature, types of switches available and remedy developments, request micro switch literature from Service at your nearest branch office. Let them show you the complete line of environmental proof, hermetically sealed switches for even more service uses. It goes to bring your switch problem to MICRO SWITCH.

Choice of Contact Arrangements and Electrical Ratings

For Switch Types A, B, and C

CONTACT ARRANGEMENT

Two single pole, double throw circuits

ELECTRICAL RATING OF 28 volts D-C (in unsealed condition)*

INRUSS
Normally closed, 15 ampere
Normally open, 24 ampere

AT 30A LEVEL
Normally, 4 ampere
Inductive, 2 ampere
Resistive, 4 ampere

AT 100,000 PL
Normally, 4 ampere
Inductive, 2 ampere
Resistive, 4 ampere

*Affected ratings correlated with data on sealed condition

For Switch Type (D)

Two double-pole, double throw circuits

ELECTRICAL RATING OF 28 volts (in unsealed condition)*

INRUSS
Normally closed, 15 ampere
Normally open, 24 ampere

AT 30A LEVEL
Normally, 4 ampere
Inductive, 2 ampere
Resistive, 4 ampere

AT 100,000 PL
Normally, 4 ampere
Inductive, 2 ampere
Resistive, 4 ampere

*Affected ratings correlated with data on sealed condition

CONTACT ARRANGEMENT
Two double-pole, double throw circuits

ELECTRICAL RATING OF 28 volts (in unsealed condition)*

INRUSS
Normally closed, 15 ampere
Normally open, 24 ampere

AT 30A LEVEL
Normally, 4 ampere
Inductive, 2 ampere
Resistive, 4 ampere

AT 100,000 PL
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Inductive, 2 ampere
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CONTACT ARRANGEMENT
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*Affected ratings correlated with data on sealed condition

CONTACT ARRANGEMENT
Two double-pole, double throw circuits

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INRUSS
Normally closed, 15 ampere
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AT 30A LEVEL
Normally, 4 ampere
Inductive, 2 ampere
Resistive, 4 ampere

AT 100,000 PL
Normally, 4 ampere
Inductive, 2 ampere
Resistive, 4 ampere

*Affected ratings correlated with data on sealed condition

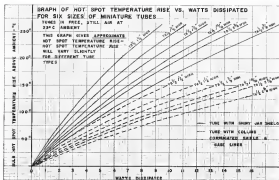
CONTACT ARRANGEMENT
Two double-pole, double throw circuits

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AT 100,000 PL
Normally, 4 ampere
Inductive, 2 ampere
Resistive, 4 ampere



HOT SPOT TEMPERATURE of miniature tubes in D3C ambient air can be determined approximately from this graphology prepared by Collins Radio Co. Solid lines show temperature for dry JAN shield coated tubes, dotted lines for JAN shields equipped with Collins heat dissipating fins. Most accurate hotspot temperature measurements on specific tube types require special test setups.

some apparatus in a tube with the 6065 where it operates at a higher temperature ambient. For example, when the 6065 is operated in 120°C ambient air, with a plate dissipation of 11.2 watts, NEIL tube reveals the following hotspot temperature rise:
• 270°C rise with a JAN shield
• 180°C with no shield
• 180°C with multi-coated shield
• 140°C with IERC shield.

Collins Test Results

In order to measure the effect of its shield heat input, Collins made ten pertinent measurements at three points on the tube envelope.

Thermocouples (No. 4 gauge copper-constantan) were embedded in the envelope at the top, middle and bottom portions of the fin surrounding the tube's electrode sections. The eight different types of shield arrangements were then mounted on an aluminum chassis, each separated by a 4-in. phenolic buffer. This permitted natural convection cooling, but prevented radiation between adjacent tubes.

A graph plotting tube hotspot temperature rise versus tube shield type is shown in p. 87 for the type 12AL7 miniature tube type. Temperature rise is shown for the direct location along the glass envelope. This graph reveals

the maximum temperature rise to be as follows:

- 151°C rise for dry JAN shield
- 155°C for black "weathered" JAN shield
- 150°C with no shield or shield base
- 121°C with IERC Type A (JAN replacement)
- 104°C for dry JAN with Collins shield base and base insert
- 90°C for black JAN with Collins shield base only
- 90°C for black JAN with Collins shield base and base insert
- 92°C for IERC Type B (JUSAF Type II)

With a number of firms moving into the field of manufacturing NEIL tubes,

the competitive situation is hot and the price picture is fluid. However, it is clear that the NEIL line itself represents a low cost addition to any vacuum equipment.

In a recent Navy competition for procurement of several hundred tubes, and NEIL shield tubes, prices quoted ran from 14 to 224 cents each. Avionics Waco has learned IERC says its tubes will sell for "under 10 cents each" as production quantities. Atlas-E-E Corp. is quoting 23 cents each in lots of 100, 5.6 cents each in quantities of 500,000. Cushman Manufacturing Co. reportedly won the Navy competition with a price of 14 cents each.

Collins Radio plans to add a new plate black JAN shield and base, both equipped with fins, for approximately 50 to 60 cents, although firm prices are not yet established, a spokesman tells Avionics Week.

By way of comparison, the IERC Type B shield sells for around 51.50 (including loss) in quantities of over 100, while a JAN replacement Type A sells for around 50 cents in quantities of 5,000 or more.

Notes of Collins

Although the NEIL line can be used with existing dry JAN shields, some questions question whether the re-

Meter Cooling Too

The corrected line has material and as the new tube shield inserts it also effective for cooling solid structures and other devices which can be heat sinks.

Heat sinks are manufactured on scrap-iron. The completed material, issued from the factory, thereby increasing the cooling surface in 50%, according to A. Q. Mott of Atlas E-E Corp., one of the firms now making the corrected line.



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MOST ADVANCED PROBLEMS

Here is the basic challenge at Antares: to make missile and aircraft electro-mechanical systems and components smaller and lighter—yet able to function perfectly under blistering heat, “earthquake” shock and extreme humidity conditions.

AERONAUTICS—North American's separate electro-mechanical division—currently has nearly 100 projects in studying new concepts of systems design...principles of guidance and control—now under development and in production—that haven't yet been written in manuals or texts.

There are many projects in guidance and control for North America's SM-64 Navaho Intercontinental Guided Missile. Projects in ingenious autopilots and fire-control systems for today's and tomorrow's ultrasonic manned aircraft. And many other projects equally exciting and challenging.

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crushed shield temperature will come at the cost of returning spring to line condition, making it less effective under subsequent shock and vibration. These observers believe that it may be better to replace the JAN shields with a black heat dissipating shield (HRC Type A or black JAN with insert lens), to enable the shield better to radiate its heat to the surroundings.

Collier's Parnian also notes that the addition of the magnet was, paradoxically, slightly current de-biasing, because the shield is effectively brought closer to the tube elements. However, since the current is returned, it should be less affected by shield movement than with a standard IAN shield. Parnian believes

The joint situation in the field of heat-insulating tube shields and manco can best be described as "combined". IFRC, a pioneer in the field for manzette type tubes, believes that the latest patent (new pending) covers the new NEL and Colfin type manco, because both employ a similar means of conducting heat from the tube to the shield.

The Government reportedly is filing for a patent on the NII, liner Calkins Rade says that it has been using corrugated shield liners "on certain production equipment since 1957" and adds that it has filed for a patent.

Addresses of announced producers of the new shield masks include: Atlas E. Corp., Bedford, Aspett, Bedford, Mass.; Batcher Corp., 4171 Valley Blvd., Los Angeles 12, Calif.; Gmch Manufacturing Co., 1036 S. Haman Ave., Chicago 24, Ill.; Collins Radio Co., Collins Rapids Ives, and International Electronics Research Corp., 177 West Magnolia Blvd., Redwood, Calif.

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★ **Therapy Gets Reliability Treatment:** Noy is endorsing the anatomic Tapes because to use all the most grading series of tests and reliability improvement programs ever attempted for the only experiment. Modifications suggested by these tests have so improved Tapes reliability that some observers believe the tests are and up being among the most reliable experiments in the field.

► **Canada's First VOR**—First Canadian communications station has been put into operation at Dorval Airport, Montreal. The VOR, and others to follow, are manufactured by Canadian Avionics Electronics Ltd.

► **Portable Transistor Tester**—With more transistors finding their way into mobile equipment, field diagnosis will

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If you can qualify, contact Les Stevenson, Engineering Personnel, Dept. 36, North American Aviation, Inc., Los Angeles 45, Calif. Phone: ORegon 8-3011, Extension 7085.

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EARLY RESEARCH AND DEVELOPMENT EXPERIENCE with electronic location equipment at G.E. began in 1935 when the first radar system with an integral ITI made land-based planes up to first radar system.

1955



IN USE TODAY, this huge modeling light tower was designed and developed by General Electric to be used with powerful search radar systems and is a major contribution to long-range aircraft location.

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6 examples show experience in all areas of land- and ship-based antenna work

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1. **Stabilized beams** to compensate for ship pitch and roll were built in large quantity with Navy antennas in World War II.
2. **Small, portable systems** for weather balloon tracking were developed and produced for the Army and Navy in 1944.
3. **Powerful long-hauling antennas**, PPS-13XW, developed by G.E. for USAT in 1949, was an advancement in long-hauling detection.
4. **Great shipboard search antennas**, largest in use today, was G.E. developed and produced for Navy anti-aircraft ships.
5. **Long-range search antennas** (PPS-1) were designed and built by G.E. using advanced construction techniques.

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4. **One of the first terminal antennas** (developed both search and diversion detection), the Navy's SP-4 was designed and produced to give a precise beam pattern.

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 Organization _____
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Wanted: Flea-Power Communications

The recent success in which a Northeast Air Line Cessna lost all power shortly after liftoff at a Hudson river airport at Basking. Despite the plot of my communications, grows up a need which a 1960 aviation industry engineers could make solve.

Newly available high frequency transmitters should make it possible to build a very economical VHF receiver, presently based on the emergency (121.5 mc.) channel and continuing to use battery supply. Such a unit should not weigh more than a couple of pounds and would take up little cockpit space. It could enable the pilot to obtain instructions from the ground, as well as establish his position from ground radio reports.

At the price of only a few more pounds it should be possible to build a frequency VHF transmitter also based primarily on 121.5 and with its own battery, to enable the pilot to make occasional on-ground transmissions.

The ultimate hazard of an emergency, however, of its position, without identification lights or communications, in a high density area could be at least partially solved with such an emergency VHF equipment.

welcome a new portable transceiver today developed by General Electric. The device, about the size of a pocket radio, checks all practice transmitters for short circuits, opens, leakage and current flow. Total, priced at \$59.95, is available from GE's Electronics Division, Skaneateles, N. Y.

► **"Hot" Tubes—"Operation Topset,"** the widest transport at Yucca Flat, Nevada, caused no ill effects on General

catena, for a new universal high-ohm-ohm radio amplifier for use in new phasers. Present RCA ANQ-9 radio amplifier (operable in not adequate above 25,000 ft) One series is working amplifier accurate to within 100 ft at 45,000.

NEW AVIONIC PRODUCTS

Semi-Conductors

► **High-frequency silicon diodes** in sub-miniature glass case, suitable for use in video detectors in 30 or 60 mc. IF stages, exhibit fast switching characteristics. Have low loss short circuit capacitance, averaging 0.8 picofarad, high reverse resistance and moderate forward conductance. Bulletin TE-108A gives application data. Same construction.



Electric receiving tubes associated from the mid-century rubble, the company reports. GE does not see how close the tubes were to the black.

► **Fire in the Sky-Pye Unit**, first in a series first, actually demonstrated one of its industrial releases for aerial reconnaissance, with a TV camera and transmitter installed in a Bristol helicopter and the picture displayed on the ground. Airborne equipment weighed about 400 lb.

► **Navy Seals Standard Cooling**, Navy Bureau of Aeronautics has asked its advance suppliers to come up with recommendations for cooling systems modules, with the objective of adopting a "general design" for its future equipment. Bells has hopes to establish on a module unit for its CNU (Communications Navigation Identification) packages.

► **Adelson Eye New Radio Altimeter**, There appears to be growing interest among the airlines, particularly overseas

also reports it is now producing silicon power resistors with 500 and 600 volt peak reverse ratings, with forward current capacities of 400 ma. at 100°C. Units occupy less than 1/4 in. Bells Bulletin TE-1115 gives application data. Western Electric Company, Newark, N. J.

► **Silicon NPN power practice transistors** are now available in eight different types in production quantities from a new supplier, General Electric Products Corp., a subsidiary of Rayco

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Fleets Manufacturing Co. Type variable width 2N161 is a variable width tape recorder, a general purpose recorder 2N162, for high frequency and high power gain 2N163 for very high current gain applications. For other models, similar to those described with the same designation, except for an "A" (2N164) etc.) are designed to handle larger signals. Complete specs are available in working copies at St. Louis, Mo., Paterson N. J.

• Semiconductor devices, including point contact transistors, junction transistors, power transistors, photo transistors and silicon junction transistors, purchased by Western Electric only for the Army Signal



Corps. will now be available to other government agencies and government contractors. Data sheets are available from Western Electric Co., Radio Div., Electronics Products Dept., 120 Broadway, New York 5, N. Y.

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• Thermal time delay relay, cutoff. Red Dot Series... comes in sealed condition with other relay base, in a variety of standard delay times from 2 to 100 seconds. Standard heater voltages are 5 V, 20 V, 515 V and 250 V, or as de Udry have 875 V contacts, rated 1 amp at 250 V a.c. other normally open or closed G. V. Controls Inc. 25 Hollywood Plaz., East Orange, N. J.

• New STA type turbine engine compressor a solid electrohydraulic, eliminating leakage and corrosion problems, second



ing to manufacturers. Unit can be operated at temperatures of -70°C to 57°C and is particularly stable at low temperatures. The unit is used to operate, better than conventional electrohydraulic systems at high temperatures. Fluided Metallurgical Corp., 1000 Capital Dr., North Charleston, S. C.

• Miniature fuse pot, with single or dual protection, comes in a 1 in. x 1/2 in. x 1/4 in. total length up to 10 in. and resistance up to 50,000 ohms per inch.



are available. Each pot has dual wires and resistance can be as low as 0.0001 ohms with single lead type. General Components Co., 360 Eighth St. S.E., Minneapolis 14, Minn.

• Fixed mount receptacle, Model PCB32B, provides connections for printed circuit board with 28 contacts. Contact bases provide extra strength and permits wafer manufacturer status. Double row receptacle is available in plastic or metal. An other model PCB32B provides two sets of five double row contacts. Uretek Co.



be supplied in a variety of mounting methods. DeJari-Avco Corp., Flushing, N. Y. 11351, Northern Blvd., Long Island City 1, N. Y.

• Fuse resistor for use in potentiometer provides constant resistance.

Davies has extremely low inductance, a temperature coefficient of 0.0005 ppm/°C, and comes in resistance values of several hundred ohms to several megohms.

Power rating is 1/5 to 2 watts, depending upon size. General Microelectronics Co., 7514 Macdonald Industrial Court, St. Louis 17, Mo.

• UHF-Electro depletors permits operation of UHF communication equipment and laser systems from a common headband antenna instead of requiring separate antennas. Radio



has less than 65 db. VSWR is less than 1.5, and isolation between channels is 60 db or more. Unit can withstand 2,000 watts peak. Micro phase Corp., P.O. Box 11658, Cincinnati, Ohio.

Instrumentation

Multi-purpose pressure transducer contains both an absolute and a differential pressure type sensor, each with dual precision pot output signal sources. Unit repeatedly has high accuracy, read



data and repeatability and low hysteresis. Farnell Electronics Corp., Components Div., 225 Park Ave., Heliopolis, N. Y., at 611 E. Washington Blvd., Los Angeles 22, Calif.

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- C. Encapsulating compound for vacuum tubes.
- D. Molded plugs for connectors.
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FRAM-PLASTIC being fit leading edge of propeller blade weights and costs only half as much as equivalent metal lining, according to developer, Curtiss-Wright.

Plastic Fairing Ups Prop Performance

A new foam-plastic propeller blade fairing, saving much cost and weight, half of an equivalent sheet metal fairing has been developed by Curtiss-Wright Corp.'s Propeller division. Flight tests indicate that the plastic fairing edges boost Super Constellation cruising speeds by 5 mph and give a better rate of climb.

Fairings are made of a polyethylene foam plastic weighing about 20 lb/cu ft. They can be installed in the field and do not require that props be returned to the factory.

The plastic can be tapered smoothly into the blade, giving a clean aerodynamic shape. It can be welded into compound curves and it is self-healing to the normal surface of a propeller blade.



FRAM-CROSS-SECTION shows close bonding of bonded plastic to metal. Rings usually used to secure sheet metal cuffs on thick are not needed with plastic fairing.

KLM Royal Dutch Airlines has accumulated 3,780 hours of flying time on the flying installation on its entire fleet of Super Constables. Other installations under way or contemplated are by Scandinavian Airlines on L-1049 Constans and Trans-Canada Air Lines on Super Constables. Air France's 1619 Super Constables are expected to be equipped with plastic faired props.

The Air Force has ordered full-scale faired props for all C-124C Globemasters and is contemplating a similar program for all C-124A aircraft, according to the manufacturer. A prototype plastic fairing is being made for the turbo-prop-powered Douglas C-119 cargo plane.

New Crash Fire Prevention System Passes First Tests

Crash fire prevention system developed for NACA and the Air Force by Walter Kable & Co., Inc., has operated successfully in its initial test work on C-130 aircraft. Next step will be a 100-hr flight test program on two C-119s.

Kable is also working with Trans Canada Air Lines on a prototype fire extinguishing and crash fire prevention system for the carrier's Viscounts. Cost of such a modification system is estimated to be about \$975, higher than a fire extinguishing system.



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SAFETY

CAB Report on Northwest DC-3 Accident

Co-Pilot Shut Throttle on Gear-Up Order

At 10:10 A.M. July 31, 1956, a Northwest Airlines DC-3, N 40191, operated on Flight 412, was substantially damaged when it ended with a porcupine pole during an attempted go-around at Yakima Airport, Yakima, Washington. None of the 15 occupants was injured.

The flight originated at Seattle, Washington, destination Spokane, Washington, with a scheduled stop at Yakima. Departure was from Seattle Tacoma Airport at 17:00 on an IFR (Instrument Flight Rules) flight plan via Costa Junction 10 at 0:05, just coming aboard. The crew consisted of Captain Loren R. Taylor, First Officer Elmer H. Green, Jr., and Second Officer Elmer White. There were 12 passengers.

According to company records, gross weight of the aircraft at the time of takeoff was 25,947 pounds and the load was properly distributed. The maximum allowable gross weight is 25,200 pounds.

At 17:15 the IFR flight plan was cancelled and without IFR (Instrument Flight Rules) cleared to Yakima. This flight was advised at 10:05, in its first contact with the company radio at Yakima of some minor weather south of Yakima airport. Three minutes later a second advisory was received reporting bird seen on the airport and read from the north. Once again, information about 75 miles south-southwest of Yakima at 10:09 the flight changed to the Yakima Central Tower frequency and received clearance for an approach to runway 12.

When the aircraft was on base leg the tower advised that the wind was north 15 knots. Approach clearance to runway 12 was then requested and received and the aircraft cleared its base leg accordingly. One minute out on final approach (10:10) the flight was advised of a 17-foot south wind and cleared to land. At this time the items had passed to the north of the airport and the ceiling and visibility were well above VFR minimums.

The aircraft touched down in the first quarter of the wet runway, rolled nearly 1,000 feet and started a ground loop. From a low altitude it veered to the ground and beyond the end of the runway, rolled a short distance and spun before coming to rest. A car, about 100 feet beyond this point, the right wing struck a porcupine pole, tearing off a portion of the wing.

The aircraft continued to fly just above the ground, across a leafless oak pasture and flew through a road 500 feet to the south edge of the pasture. It landed a few feet past the tree and rolled about 100 feet before a stop. All passengers left the aircraft unscathed, but the rear right door and were then guided to a safe distance to the chowline.

The clearance from the approach to runway 12 to runway 16 was made while the flight

was less than 100 feet north of the airport to get out proper runway alignment. A number of passengers observed the approach and touch down. The company of three stated the approach appeared to be at a normal altitude but possibly later than usual.

All agreed that there was a considerable amount of water on the base of the field.

top runway at the time of the landing. Runway 14 which was 5,000 feet long, was in good condition and adequate runway.

'Hydroplaning' Effect

The captain, who had flown the aircraft from Seattle stated the touchdown was at an indicated airspeed of 70 knots on the



60 seconds a minute

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Consider where you travel along in this speeding time. Yet no two rush their private definition at the same time, no by the same name. For what the Future has to unfold is individually determined.

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So, because time is constantly being imposed upon you, you can feel

partially like your gift, your Future is missed by stress and strain, and here is but that our lives be expanded.

Should you be encouraged to use to the fullest your special talent — and you are one then — you are among the first to see. Yours is a Future filled to the brim with satisfaction and needed by others.

At Sikorsky Aircraft we take great pride in the advancement of our talented engineers. We do our utmost that every second may count for them in their sixty-second-a-minute journey in the Future. For anyone who has talents like theirs, we would do as we can.

Please write to Mr. Richard Aiken, Personnel Department.



SIKORSKY AIRCRAFT

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SAFETY

the flight deck his testimony was "At the time the accident occurred I was in position to take the controls and take such action as I could see necessary to—when the motor came, I moved them by spontaneous action."

The first officer's left hand was resting on the control pedestal but not touching the throttle, as the go-around started. He further testified that he observed that the radio altitude was low at more than the ground when near the end of the runway and at that time he was waiting for the captain's order to reduce power and not reverse.

State Inmate at Northwest National Post Office Center had been there sometime near the Seattle National Spokane route with Captain Taylor. He had been discharged in December 1955 and recalled on July 11, 1956.

Mr. Conway had qualified an DC-1 equipped with Northwest Airlines in March 1952 at Minneapolis, Minnesota and had assigned 1,200 hours on DC-1 since that time.

Weather Effect

U. S. Weather Bureau records indicate that cumulus cloud formations began to be reported about noon, on July 15, 1955 over the Cascade Mountains near to western Washington. By late afternoon and early evening a few isolated thunderstorms were reported. There were scattered reports of relatively small cumulus clouds during the night.

The surface winds accompanying the thunderstorms were variable in direction and gusty. However due to the localized character of the storms, the wind was of short duration. The storm that passed over the Yakima Airport shortly before flight 4411 briefly traveled from the southwest to the northeast and was over the field for not more than two minutes.

The U. S. Weather Bureau at Yakima reported maximum gusts of 40 knots during the storm and no windshift was noted. The report introduction was somewhat doubtful during the storm approach and landing. The introduction although held electrically and visually, contained a description of the wind shift and rising rapidly with my wind shift of 15 miles per hour in one hour. The U. S. Weather Bureau at Yakima has not recorded 45 mph precipitation during the storm.

ANALYSIS

A local thunderstorm was over the airport a short time before flight 4411 occurred.

This storm placed 45 mph of rain on the runway at a very short time but the storm had passed the airport at the time of the landing. The runway was quite wet which resulted in poor braking.

Touchdown on the last quarter of a runway, with no braking holding action, resulted in a definite possibility of overrun. Therefore, the captain's decision to go around appears to be proper. He had made previous go-arounds on runways 16 during his twelve years of piloting for Northwest but here and there is no reason to doubt that this one would not have been successful had he not been for the unexpected power rater.

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Cessna P-102	Northrop F-5, F-5H
	North Atlantic F-4, F-105

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SAFETY

might caused by the first officer's action of closing both throttles instead of retarding the landing gear as ordered by the captain.

FINDINGS

On the basis of all available evidence the Board finds that:

1. The crash, the accident and the crew were preventable.
2. The poor weight of the aircraft was under the minimum allowable and the load was improperly distributed.
3. The engine failure was not from a root cause which prevented normal landing action.
4. The captain properly initiated a go-around to avoid a possible crash.
5. After becoming airborne the first officer closed throttles, the captain's order "give up."
6. Instead of retarding the gear as ordered by the captain the first officer closed the throttles.
7. The power interruption caused the aircraft to immediately settle to the ground.
8. After power was applied the aircraft struck a powerline pole.
9. There was no failure or malfunctioning of the aircraft or its component parts in striking the pole.

PROBABLE CAUSE

The Board determines that the probable cause of this accident was the cockpit's action in closing the throttles which value greatly resulted in the aircraft striking a powerline pole.

By the Civil Aeronautics Board:

Ross R. Baker
Joseph F. Adams
John Lee
Chas. G. Grier
Homer D. Dewey

SUPPLEMENTAL DATA

The Civil Aeronautics Board was notified of the accident by Northwest Airlines Dispatch Office, Seattle, Washington, at 1900, July 15, 1975. An investigation was immediately initiated in accordance with the provisions of Section 701 (a) (7) of the Civil Aeronautics Act of 1946 as amended. A second investigation was ordered by the Board and dispatch was taken at Seattle, Washington on August 2, 1975, and at Yakima, Washington on August 4, 1975.

Air Carrier

Northwest Airlines Inc., a incorporated in the State of Massachusetts and maintains its principal place of business at Manchester, Massachusetts. The company possesses a certificate of public convenience and necessity issued by the Civil Aeronautics Board and is an active operating certificate issued by the Civil Aeronautics Administration which authorizes the carriage of persons, property, and mail over the route described in this report.

Flight Personnel

Captain Loren E. Taylor, age 46, was employed by Northwest Airlines as a pilot in 1975. He holds a valid current certificate with an air transport rating and type rating for DC-3 aircraft. Captain Taylor has, according to company records a total of 7,315

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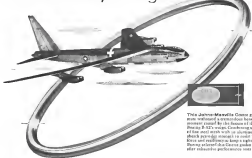
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PRODUCTS FOR THE
AVIATION INDUSTRY

SAFETY

pilot losses of which 2,324 were required in DC-3 equipment. His last first class physical examination was passed on June 3, 1915.

First Officer Howard H. Goetz, Jr., age 36, was employed by Northwest Airlines as a pilot in 1915. He holds a valid master certificate with commercial pilot, single and multi-engine land, instrument, and flight instructor ratings. Mr. Goetz has accumulated in company records, a total of 1,400 pilot hours of which 1,240 were acquired in DC-3 equipment. His last 602 class physical examination was passed on September 10, 1954.

Stratford Eleanor Elmer White was employed by Northwest Airlines on October 3, 1954. Her DC-3 check ride was on January 25, 1915, and March 10, 1915, was graded as satisfactory.

The Aircraft

N 45133, a Douglas DC-3, serial number 1759, was owned by Northwest Airlines, Inc., and was manufactured on October 5, 1942. It had 17,149 flight hours when the accident occurred.

The aircraft was equipped with Pratt and Whitney R-1530-37 engines and Hamilton Standard model 2E30-471 propellers. Total air both engines and both propellers was 6,000 hours. The engines had 791 hours and 993 hours, respectively.

Signal Tells Pilot When to Feather

Satellite is an automatic power lever indicator which operates on the torque principle to flash a red signal indicating the correct propeller to feather.

The equipment's torque sensing unit is attached to the airplane's engine mounts.

The manufacturer points out that when an engine is delivering power, the mount is subjected to a bearing force. Upon cessation of power, this force is released. Satellite senses this release of torque and actuates the cockpit signal.

Weight for a two-engine installation is less than 4 lb. and installation takes less than one day. The manufacturer is soliciting individual bids for applicable types of aircraft to Civil Aeronautics Administration for approval.

The maker is Allied Instrument Manufacturing Corp., 3240 Towler, Houston 17, Tex., an instrument manufacturer and subcontracting firm.

Spanish Airline Orders Five Convair 440s

Spain, the Spanish airline has ordered five Convair 440 Metropolitan for use on its continental routes out of Madrid. The order, scheduled for delivery about a year from now, brings the total number of Metropolitan ordered to 74. The first Metropolitan off the production line was delivered last week.

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With the highly successful NAVY F4B FURY jet* in production, and with other, years ahead designs being developed, North American's Columbus Division has become a self-sufficient, proficient organization within North American Aviation, the company that has built more airplanes than any other in the world.

Geographically, a complete airframe manufacturer in Ohio offers individual advantages to many engineers. The Division's complete design, development and manufacturing responsibility for North American's Naval planes is its own Challenge. North American Aviation means stability plus availability of vast engineering data and resources. The Division's growth and success mean greater individual opportunity.

A SELECT FEW POSITIONS ARE OPEN IN EACH OF THESE FIELDS:

Aerodynamics, Thermodynamics, Dynamics, Stress Engineers, Structural Test Engineers, Flight Test Engineers, Mechanical and Structural Designers, Electrical and Electronic Engineers, Wind Tunnel Model Designers and Builders, Power Plant Engineers, Research and Development Engineers, Weight Engineers.

For the Full Story On Your Own Future, Write Today: Mr. J. H. Fagan, Personnel Manager, Department 96AW, North American's Columbus Division, Columbus 16, Ohio.



Engineering Ahead for a Better Tomorrow

NORTH AMERICAN AVIATION, INC.
*See U.S. Pat. 2,618,000
COLUMBUS DIVISION

The Year Advertising Helped

IN 1954 we had a business recession in the United States. Sales fell about 4% during the year. If management had followed the historic pattern of business ups and downs, advertising volume would have fallen much farther.

But in 1954 the volume of advertising did not fall. It increased over 2%. Every effort was made to stimulate sales where sales were needed to sustain prosperity.

This was something entirely new under the sun. It had a powerful influence in making the recession of 1955-56 one of the mildest on record. It helped greatly to speed business on to the record-breaking levels it has attained today.

There are several reasons why America's business management attacked this decline in sales with more advertising. One of them grew out of the greatly strengthened position of the American consumer market. Consumers' income after taxes has been rising an average of over \$10 billion a year since 1946, and this rising income is more widely distributed than ever before. Furthermore, consumers have piled up reserves of about \$213 billion in cash or its

equivalent. These reserves offer a new and powerful inducement to increased selling and advertising effort even in the face of a possible decline in consumer income.

Taking the Longer View

However, the principal reason why a sales decline was attacked with increased advertising is management's new-found conviction that good advertising is essentially an investment in the development of a market. Successful development requires sustained investment. The inclination of business management to take the longer view, it, of course, motivated by the fact that the American market, with over 3 billion consumers being added annually, is growing at a prodigious rate.

Ten years ago only a handful of companies had plans for investment in new producing facilities extending beyond the current year. Today almost all leading companies have investment programs running some years ahead. And keeping pace with these long-range business investment plans has been the development of sales and advertising programs to

reach tomorrow's greatly expanded markets.

This crucial role of advertising in providing driving power for our economy is gaining greater recognition every day. In his recent book, "People of Plenty," Professor David M. Potter of Yale University remarked: "Advertising is not badly needed in an economy of scarcity, because total demand is usually equal to or in excess of total supply, and every producer can normally sell as much as he produces. It is when potential supply outstrips demand—that is, when abundance prevails—that advertising begins to fulfill a really essential economic function."

Advertising's Key Role

Today abundance so completely prevails in the United States that it has been conservatively estimated that as much as a third of everything offered for sale falls in the realm of "optional consumption." That is, consumers can "take it or leave it" without any immediate personal inconvenience. But if they decide to "leave it," a terrific economic depression will not be far behind. In such circumstances, advertising—in

which, in all of its forms, we are now investing about \$9.2 billion annually—clearly is of crucial importance to our continued prosperity.

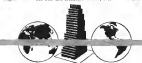
In performing its key role in past years, American advertising never relaxed its full potential. It successfully promoted sales. But it never was called upon to promote to overall economic stability as a direct outgrowth of increased sales.

By successfully promoting both sales and economic stability, as it did in 1954, advertising surely has added new strength to the American economy. It has also added a great new and constructive dimension to advertising itself. That accomplishment makes the celebration of our first National Advertising Week (February 19-25) a particularly notable occasion.

One of the sweetest means of expanding your sales volume in today's \$110 billion consumer market is through dynamic advertising in the publications directly serving your major customers and prospects.

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HEADQUARTERS FOR

BUSINESS INFORMATION

AIR TRANSPORT

Allegheny Pleased With Martin 2-0-2s

Low cost, successful operation, public acceptance convince carrier plane now is ready for heavy duty.

By Craig Lewis

Washington—Allegheny Airlines, the third local carrier, came to use the Martin 2-0-2, a finding out its first year of operation with a mixed fleet and preparing to expand its Martin operations.

After some difficulties and disappointments during the last months of Martin service, Allegheny thinks the aircraft cycle a model and that the 2-0-2 is ready for heavy duty in the coming peak summer season. President Leslie D. Barnes told Aviation Week: "Allegheny is even happier with the Martin now than it was when the initial purchase was made."

Allegheny bought its first four Martins last spring and has operated them on some of its lighter routes to give experience and develop reliability. Last month, two more Martins were added to the fleet which includes 14 DC-3s.

Passenger Load Grows

One of the original Martin men lost when an engine caught fire on a training flight. Damage was so extensive the airline decided to replace the plane rather than repair it. "That Allegheny wrote up with a total of five 2-0-2s for a little over \$1 million. Barnes says the Martin package provided a cheap, modern plane to supply a pressing need for carrier aircraft."

The local airline is encouraged by public acceptance of the new transport and is optimistic about the summer season when it gets into full flying. Passenger loads on the 2-0-2s have

shown a growth which runs counter to the trend in other airlines (see box on next page). In January, the average load on the Martins was 35.4 while the DC-3 average was 9.6, compared with a DC-3 average load of 9.8 in January of 1954.

The expansion in Martin loads is more encouraging because of the unusually bad weather conditions in January. Operating percentages for the month ran 83%, compared with 96% for the previous January. Allegheny expects the Martins to be operating five of six days when load factors prior the 50% mark and the first year of operation began to pay off in operating expenses.

The expense of the five Martins represents nearly a third of the airline's total, since the airline didn't reduce its original fleet when the 2-0-2s were acquired. Once DC-3s loaded in the deal was a non-transferable airplane. Allegheny was obliged to dispose of before the new transports were bought.

Barnes says that his airline has its current plant to buy more 2-0-2s, but that when more capacity is needed to handle traffic growth, it will be provided for through the purchase of Martins or other aircraft if so Martins are available. There are no plans to add to the DC-3 fleet.

Mixed Fleet Criteria

Allegheny doesn't even expect to have as many Martins operation. Some points on the carrier's criteria have neither the support facilities nor the traffic to support anything but a DC-3 operation. Until an efficient replacement for the

DC-3 is available, Allegheny will use a mixed fleet, and Barnes predicts that there is little future prospect of a single-class fleet for local airlines because of that characteristic.

The Martin was bought by Allegheny as a transitional asset to provide for business growth while a replacement for the DC-3 is developed. The airline feels that the introduction of the 2-0-2 will allow it to make time to look at the DC-3 replacements and wait for them to prove themselves.

Barnes points out that the United T-61 and the Douglas P-61 (Berkel) are the two potential replacements that have prototype flying, are at least two years from actual operation. Both lack service, he says, but then say both economically improve. According to estimates, suitable costs of the Martin 2-0-2 are better than either the T-61 or the P-61 right now, Barnes said.

A DC-3 replacement will have to meet to a substandard operation, Barnes says. He agrees with the general industry opinion that the local airlines will never get off subsidy while they are forced to use the DC-3.

CAB Support Needed

In order to get off subsidy, the local airlines are going to have to spread substantial amounts of money and they will need the support of Civil Aeronautics Board policy to do it, according to Barnes. He feels the CAB will have to shift its policy on subsidizing local airline activities before the system will be able to make any serious move to acquire a replacement for the DC-3. Prices currently quoted on replacements are around \$200,000.

The CAB has previously refused to spend any extra money to help a carrier line move on to more modern equipment. When Pioneer Airlines re-equipped with the Martin 2-0-2, the Board turned down a request for extra subsidy to make the same. Pioneer shifted back to the smaller DC-3 and eventually merged with Continental Air Lines.

Southeast Airlines has had more luck with the switch to Martins, although the CAB said it couldn't permit that DC-3s carry on air traffic on the Martins. Local Southern's Martins met Midwest Airlines' C-47s. Allegheny's new transports are strictly a management aid, and the Board help will it will provide any financial help.

Allegheny Airlines

Average Passenger Loads

	1954	1955	1956	1957	1958
DC-3	DC-3	DC-3	DC-3	DC-3	DC-3
July	10.5	12.6	15.2	15.1	
Aug.	11.1	12.1	14.6	14.9	
September	11.0	12.6	16.5	15.5	
October	11.1	11.9	14.9	12.6	
November	10.0	13.4	15.5	15.5	
December	9.1	9.8	14.0	14.5	

Barnes doesn't think the local airlines will get off subsidy until there is some change over, including replacement of the DC-3 and relief from special restrictions applied by the local carriers by the CAB. The third necessary change, according to Barnes, is the acquisition that the transition from the DC-3 "will be slow, tortuous and dangerous" unless it is backed with CAB policy.

Mid Fly Outlines

Allegheny's net pay has declined each year since 1952 as business has recovered, and it is expected to continue to decline. The carrier's system is expected to receive a 19% in plane order bonus each year for the next three to five years. While 1956 plane orders are increasing 19%, Allegheny expects revenues to drop at least 15%.

Last year traffic showed a 31% gain to 545,000 passengers and 57,510,000 passenger miles. Express tonnage increased 46% in 1955.

Senate Unanimously Passes Subsidy Law

Washington—Legislation authorizing the death penalty or life imprisonment for sabotage of commercial vessels or aircraft is a direct war power enactment by the Senate.

Introduced by Sen. Warren Magnuson (D-Wash.) chairman of the Commerce Committee, the measure provides a penalty of \$10,000, or 30 years imprisonment or both, for (1) an act of sabotage which does not result in a death, and for (2) life imprisonment, if death results, concerning an attempt being made in commercial aircraft sabotage.

The crash of a United Air Lines plane near Denver last fall as a result of a bomb placed in a passenger's baggage, which caused six deaths, focused attention on the need for the legislation.

Sen. Earl Warren (D-Mich.) pointed out that statistics now in effect are not adequately cover aircraft sabotage or do not provide penalties commensurate with the crime.

Curtis Takes White House Post To Tackle Nation's Air Problems

By Phyllis Staver

Washington—Edward P. Curtis takes office next week as Special Assistant to the President for Aviation Facilities Planning, a position which was recently created by the Budget Bureau's Aviation Facilities Study Group headed by William Barclay Harding (AW Jan. 16, p. 20).

Curtis has been spending the time since his appointment on Feb. 11 in consultations with Harding and other members of Harding's study group. He has also visited with the Secretaries of Commerce and Defense, one of whom is to designate a top-level department official to work for Curtis in a liaison capacity.

Initially, Curtis is expected to work with a staff permit itself. He may have to rely on the assistance of all seven offices, who were suggested in the Harding report.

The President's action in appointing Curtis represents full endorsement and direct implementation of the Harding group's recommendations. The group had stressed the need for "full time high-level leadership to direct a continuing long-range study to assess present an integrated aviation facilities development program, coordinated by a designated national air traffic organization."

President's Concern

The responsibilities delegated to Curtis include:

- Direction and coordination of a long range study of the nation's requirements for aviation facilities.
- Development of a comprehensive plan for meeting the most critical and immediate needs of the nation in the field of aviation.
- Formulation of legislative, organizational, administrative and industry recommendations to implement the plan.

In naming Curtis, the President emphasized that the "revolutionary possibilities and the all-embracing character of aviation development require an independent, overall study of the nation's aviation problems."

"It is not an easy task," he said, "because the rapid technical advances in aviation and the remarkable growth in the use of air transportation have overwhelmed the nation with serious aviation facilities problems."

"Modern aircraft can be operated in



Edward P. Curtis, newly appointed Special Assistant to the President for Aviation Facilities Planning, a post created by President Eisenhower. The 39-year-old Eastern Kentucky graduate is a long time friend of the President. He served as a major general and chief of staff of the Strategic Air Force during World War II. He was the command of Gen. Carl "Toots" Spaatz. He holds a private pilot's license and was a member pilot in the San Francisco Navy. Staff officer at the Air Force Reserve, Curtis, a divorcee of the Air Force Association.

the numbers required by the actual demands and the civilian economy only if airports, navigation aids, air traffic control devices and communication systems are suitable for their needs.

"Moreover, uncoordinated further increases in air traffic, the establishment of new airports for civil as well as military aircraft, the additional being made in refueling, and the greater use of higher altitudes, all present much heavier demands upon our facilities for navigation and traffic control," the President said.

Top Level Cooperation

A comprehensive aviation plan should provide the basis for these accomplishments:

- Timely installation of technically adequate aids.
- Optimum coordination of efforts of the civil and aviation agencies.
- Development of costly duplication of services and equipment.
- Effective participation by state and local authorities and aircraft operators in meeting facilities requirements.

To delay the development of the plan is to invite further congestion of



AFTER INITIAL difficulties, Allegheny is ready to place its 2-0-2s on heavy-duty routes.



Announcing...

"the Bellairus"

a new concept of executive transportation

Now, go by air as never before. Faster, safer, more comfortable, *there's there*—in the BELLAIRUS, the helicopter designed exclusively for executive and utility operations.

This newly styled, three-place helicopter is the latest member of Bell Aircraft Corporation's famous Model 47 series—the world's most widely used commercial helicopter.

The Model 47H BELLAIRUS fills the need for a new dimension of executive transportation—*not the drive, but—* from office to plane, plane to guest office or plant to airport. It is spacious, extremely decorated, accommodates a

pilot and two passengers, and has ample head and leg room, soundproof cabin and large baggage compartment.

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Canada's Maritime Britannia

Proposed pilotless version of Bristol Britannia turboprop transport being developed by Canair Ltd. as a military reconnaissance aircraft is shown in sketch. Aside from the pattern engine, which will replace the conventional Britannia engine to provide longer range at low altitudes, changes shown in sketch include a large cabin door under the nose and a stronger tail to house Vespene Aircraft Detection gear.

the recipient, endless limited resources, lack of maintenance to sustain and permit expansion of the national force."

President Eisenhower and Canair has been assured by the President that he will have the cooperation of both the Department of Commerce and Department of Defense—both concerned with air travel. These two and all other agencies concerned with aviation are to be Canair's prompt responses as he carries out his assignment.

The President told Canair "I already exist with the Government... a wealth of experience, much of which should be helpful to you." Canair was authorized to call upon any official of the Executive Branch for assistance.

President Eisenhower said: "I shall expect that from time to time you will give me reports of your progress and that you will promptly advise me of anything that I might do to expedite your work."

FHA, VA Reassured On Jet Noise Problem

Washington—Justice and security in urban communities have prevented an expensive picture with regard to future jet transport noise and urban problems, in contrast to possible reports made by industry leaders at the recent Jet Age Conference here (AV, Feb. 11, p. 31).

The highest version of what will happen when thousands of jet transports are introduced came at a joint conference here between airline and industry executives and officials of the Federal Housing Administration and Veterans Administration.

FHA Commissioner Norman G. Mason and the aviation experts indicated that development of civil jet aircraft probably will accelerate so great change in the use of location of present day airports and the aircraft noise situation in airport communities.

Mason and the FHA had been apprehensive about the approaching "jet age" because it is being said to mean more money, more homes and apartment projects, more airports.

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Mason and the FHA had been apprehensive about the approaching "jet age" because it is being said to mean more money, more homes and apartment projects, more airports. Masons ran up to 30 years' distance, and FHA and VA issued a language forecast.

The industry experts told Mason that "noise suppression programs to date given even indication that jet transports will have outside noise characteristics comparable to present piston engine craft."

Mason and he said that assured that the airport of the future is not going to be too much different from today, although he is proud there may be an expansion of airports.

As a result of the statement, Mason said, "FHA will attempt to make jet age removal of its mortgage insurance policies for homes new airports."

FHA and VA are to be kept as informed as noise research by the industry, as well as the Civil Aeronautics Administration, which also was represented at the joint meeting. Officers associated included Airport Operators Council, Air Transport Union, Aircraft Industries Assn., and the National Air Transportation Coordinating Council.

Civil-Military Radar Use Studied by CAA

Washington—Problem of joint civil-military use of air defense radar information for air traffic control purposes are now under active study by the Civil Aeronautics Administration and the Air Force.

A two-and-a-half year evaluation program, sponsored by the Air Navigation Development Board, gets underway this week. It is being conducted by CAA's Technical Development and Evaluation Center at Indianapolis in cooperation with the Continental Air Defense Command at the latter's radar installations at Beale Air Force Base.

The evaluation will determine and test possible methods for CAA use of ADC radar for air traffic control with out compromising the primary mission of the ADC. A two-part program will study the performance of equipment in meeting the differing requirements of air defense and traffic control and testing the combining of air radar information in the traffic control center.

Initially, CAA and the Air Force are making light evaluation checks of the Beale ADC radar. This is intended to show what coverage and communications required for air traffic control flight planning will be done at both low and high altitudes. CAA control from the Indianapolis Air Route Traffic Control Center will control a portion of the radar information from the Beale installation, maintaining contact with the ARTCC by telephone.

The second phase of the study, beginning in June, will be the first of a 12-mile continuous flight for evaluating radar information from the Beale ADC radar to the Indianapolis ARTCC. The routine flight will be expected to extend over a two-year period.

Permanent Routes Asked For Alaska, Hawaii Lines

Legislation during permanent construction of routes to Alaska, and into Hawaii, Alaska operations was introduced by Sen. Warren Magnuson (D-Wash.), chairman of the Senate Commerce Committee.

Two measures would have the effect of providing permanent certificates for Pacific Northern Airlines, Alaska Air Lines, Hawaiian Airlines and Trans Pacific Airlines. One bill stipulates permanent certificates for Alaska Airlines and Hawaiian Airlines operating under transport certificates who make application within 120 days after enactment. The other stipulates permanent certificates for U. S. Alaska airlines applying within 120 days, provided service has not been "inadequate and inefficient."



	AER LINGUS IRISH AIR LINES
	AIR FRANCE
	BRITISH European AIRWAYS
	B-W-I-A BRITISH WEST INDIA AIRWAYS
	Capital AIRLINES
	TAA TAMSA-Argentine Airlines
	TRANS-CANADA AIR LINES

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tinuous wing lift ratio data. A panel-mounted indicator offers the pilot an accurate reading to maintain stable flight...especially significant for turbo-jet aircraft at the high lift coefficients encountered in take offs, approaches and landings.



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Appeals Court Upholds CAB on Surface Mail

Washington—The right of the Civil Aeronautics Board to allow cargo airlines to carry surface mail under occupation authority has been upheld by the Court of Appeals.

In a split decision, the U.S. Court of Appeals for the District of Columbia supported the CAB's decision to let Shell Airlines Flying Third Line and Pacific Airlines take part in the Post Office Department's experiment of shipping surface mail by air.

The majority opinion finds that the Board can authorize an airline to carry mail under its occupation powers. In the case of the three all-cargo airlines, which aren't certificated for mail, the Court agrees with the Board that national considerations permit occupation authority for participation in the surface mail experiment.

These cargo carriers have available space in which surface mail may be carried," the Court said in its majority opinion, written by Judge Wilbur M. Wright. "The Postmaster General may use these services on a governmental basis."

The experiment appears to be limited to a reasonable time.

"Confidence percentages on either a permanent or interim basis could not be completed in time to enable the cargo carriers to participate in the experiment. We think there are 'national considerations' affecting operations with the unknown amounting of the time."

In a dissenting opinion, Chief Judge Elmer W. Tamm states that the considerations involved do not warrant occupation authority. That authority was taken away, and that surface mail experiments may be held, are certain matters affecting all certificated airlines," he said.

"It seems to me to follow that there was not 'national considerations' affecting the carriers the Board has certificated. Moreover there was no consideration affecting the operation of the carriers. For these and other reasons I think the Board exceeded its authority in granting the experiment," Judge Tamm said.

Engine, Pilot Cause Curry DC-3 Crash

Washington—The crash of a Curry Air Transport DC-3 was caused by engine failure and failure of the pilot to verify his own judgment while proceeding to an emergency landing, according to a Civil Aeronautics Board accident report.

The accident occurred at the Lockheed Air Terminal in Burbank, Calif.,

last September when the DC-3 decked upon engine trouble after takeoff in maximum visibility. The crippled plane was cleared for an emergency landing, but it failed to clear itself of a runway on making its approach.

Approaching at a steep high altitude, the DC-3 struck a power line, rolled over and crashed into the two Air Force C-47s parked on the field. The DC-3 then careened, skidded along the grass and crashed into a Lockheed service hangar.

The pilot and copilot and an air stewardess of Lockheed Air Service Terminal were killed.

Investigation revealed a serious engine malfunction which occurred after takeoff.

The probable cause of the accident, according to the CAB report, was the pilot's reversible commitment to a landing without radio or visual contact, awareness of his own significant fuel burning engine failure immediately after takeoff.

Slack Airways Cancels Lockheed 1049H Order

A Slack Airlines order for three Lockheed 1049H Super Constellation air freighters has been canceled, Lockheed announced. Cargo commitment has nullified the order.

Slack recently placed three Douglas DC-6A cargo planes from Aer Work Ltd. following the British all-cargo line's commitment from the Atlantic run.

The DC-6As, which were ordered at the available, satisfied Slack's urgent needs for increased capacity. "The Lockheed order was scheduled for 1957 delivery."

Branniff Begins Flights Over New Eastern Route

Branniff International Airways last week inaugurated service over its newly opened route to the Northeast (NW-Norw 24, p. 12). Branniff, the Dallas-based carrier, is adding three daily round-trip DC-8 schedules between New York, Airport and Dallas. Two of the schedules are first class, and one flight each way is one day between Norfolk and Dallas. The third schedule is a night coach.

CAB Orders

July 24th to

GRAVED

Leave to intervene in the St. of Case in the case involving transfer of TWA's Cincinnati Detroit route.

Western Air Lines further tries to duck charges to extend its routes, report to withdraw its application to the United States Supreme Court.

Norfolk Constellation Airways as its application to serve Washington, Me., on its

route between Annapolis and Bethel, with certain limitations. The authority is for one year or until decrease in the form of a new order is received.

Atlantic Airlines authority to meet service at White Plains, N. Y., on all flights over against two of British 44 in cases of one daily round-trip flight Virginia through Dallas, and to meet White Plains on all flights over the route on Saturdays and Sundays.

Flying Tiger Line as exception to perform across charter flight to New York from London, Paris, Geneva, Rome, Athens, Cairo, Ankara and Moscow. Handling on Monday, pursuant to a contract with the International Civil Aviation for European Airlines.

Kidde Airlines as exception to perform a DC-4 aircraft from New York, Me., to Boston.

Eastern and Western Airlines as exception to provide free transportation to injured passengers at the Lockheed Aircraft Corp. and the Curtiss-Wright Corp. for flight discounts for six months.

Leave to intervene in the Service New York, Me. on the Charter of One year of the Borough of Queens, New York City.

APPROVED

Pacific Northwest Airlines' agreement with Western Airlines to provide service on Pacific Northwest route in the Pacific Area was said a decision is reached in the investigation of the late Airline services.

Interlocking relationships between Super Green, Pan American, World Airways and Pan American Cargo Airlines.

ORDERED

Japan Air Lines' authority to perform a charter flight between San Francisco and San Paulo, Brazil, extended to May 31, 1956.

DISMISSED

Ameyman and investigation of a late between El Paso, Texas, and Tampa, Fla., filed by Pennsylvania Transport, since the late has been cancelled.

Ameyman and investigation of late between Boston, Mass., and New York, New York, and Philadelphia, Pa., in New York and Philadelphia Air Transport, since the late has been cancelled.

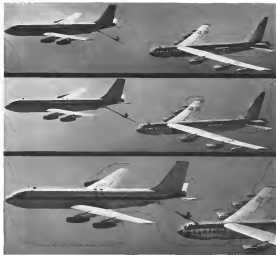
Ameyman Air Lines and the City and County of San Francisco petition for reconsideration in the Denver Service, Case.

DEINED

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Jet-to-jet refueling at 500 miles an hour

The Boeing jet tanker prototype is put through a series of tests, including a refueling test with an eight jet B-52 bomber.

This operation is part of an intensive test program in which every detail of America's first jet tanker, the Boeing KC-135, will be proved out well before the first production model rolls off the line.

For more than a year the Boeing prototype has been accumulating the kind of data obtainable only in actual flight. The testing developments and design refinements have already been incorporated in the KC-135's new tanking shape in Boeing's Renton, Washington, plant.

Boeing proving-out the airplane itself, the prototype makes it possible to test thoroughly the streamlined new Boeing Flying Boat, and all aspects of jet-to-jet refueling at speeds above 500 miles an hour, and at altitudes over 35,000 feet. This means that when deliveries of the KC-135 to the Air Force begin, the airplane will be operationally proved. And it will be equipped with a flight-tested jet-to-jet refueling system.

The prototype jet, during its hundreds of hours of practice test flying, performed beyond expectations. This is just a result of Boeing's unique experience de-

signing and producing more large, multi-jet aircraft than any other company in the world. These include the B-52 eight jet bomber, and more than 1,500 jet B-47 medium bombers. In addition, Boeing pioneered the development of aerial refueling. It has built more than 600 Boeing KC-97s, the stretched jet-propeller-driven tankers of Strategic Air Command.

This is the unexcelled background that gives assurance to the Air Force, and to the nation, that the Boeing KC-135 will be another outstanding, dependable aircraft.

BOEING

Airline Traffic—December 1955

	Total Passenger Miles	Revenue Passenger Miles (1000)	Local Traffic	U. S. Airtel Ton-Miles	Express Ton-Miles	Freight Ton-Miles	Total Revenue Ton-Miles	Per Cent Revenue to Available Ton-Miles
DOMESTIC								
American	5,013,893	341,863	68.06	9,089,774	1,110,804	6,875,213	43,389,499	68.58
Boeing	199,807	13,246	37.37	161,980	150,004	350,309	4,405,515	55.37
Capital	795,708	63,069	58.46	593,316	553,549	360,415	7,007,233	45.08
Continental	39,843	3,344	43.71	30,710	8,100	34,254	753,574	49.83
Go-into-air	51,891	18,269	50.75	46,208	31,154	133,795	8,089,909	43.09
Dallas	555,750	75,500	60.09	330,431	979,868	690,385	3,615,761	57.31
Eastern	5,513,505	309,939	57.61	1,134,136	189,334	1,416,213	19,374,764	43.08
Norfolk	1,06,815	77,493	38.41	47,739	66,422	480,021	6,948,355	60.18
Northwest	70,603	8,538	56.51	11,735	35,435	53,778	805,345	55.35
Northwest	80,479	11,344	57.64	59,478	285,180	180,527	3,245,964	54.44
TWA	300,396	244,445	55.18	1,485,530	922,254	1,688,564	19,390,109	59.45
United	434,591	280,433	60.61	3,057,453	1,251,431	2,640,871	33,778,274	55.68
Western	84,071	41,221	55.83	334,130	75,709	893,454	4,638,472	55.58
INTERNATIONAL								
American	9,672	6,770	61.51	14,712	548	243,492	975,838	64.80
Boeing	3,723	3,893	30.17	40,581	30,745	805,503	3,055,001	30.61
Continental Atlantic	12,816	984	58.54	1,565	4,180	91,759	91,759	32.18
Continental	1,601	1,204	48.58	160	4,480	145,333	145,333	46.25
Dallas	4,051	5,518	34.81	11,039	33,561	686,731	686,731	44.14
Eastern	10,418	18,468	58.38	133,194	109,470	8,616,134	58,477	49.47
Norfolk	9,610	5,963	38.35	32,449	3,090	45,335	545,305	61.39
Northwest	8,799	16,761	53.04	1,581,647	23,483	545,102	4,504,859	79.39
Pan American								
Alaska	5,323	9,454	53.40	65,475	351,889	1,898,807	1,898,807	38.50
America	59,036	73,878	60.50	1,031,440	3,744,338	11,952,739	45,972	45.92
Boeing	10,446	14,705	63.46	2,640,184	1,289,848	8,833,356	65,821	65.82
Latin America	81,938	10,055	30.01	311,237	3,481,349	18,303,068	58,525	58.52
Europe	11,437	13,817	54.59	60,889	1,743,889	1,743,889	1,743,889	34.56
TWA	14,058	30,313	60.61	1,482,038	6,706,191	13,550,213	47,485	47.48
United	5,376	14,556	65.77	160,965	40,740	1,722,626	73,754	73.75
LOCAL SERVICE								
Alaska	24,470	4,055	40.87	50,773	80,497	494,434	43,460	43.46
Boeing	8,364	3,878	30.00	3,321	8,646	3,948	197,680	35.15
Continental	1,501	1,290	39.53	2,038	3,574	4,026	136,412	39.53
Eastern	18,504	3,369	41.54	27,462	8,027	45,657	415,713	58.95
Lake Central	8,370	1,379	33.05	8,432	15,432	154,492	154,492	15.03
Northwest	24,613	4,505	39.87	8,734	7,470	9,176	453,454	39.86
Northwest	34,768	5,771	44.36	37,399	34,481	352,448	41,641	41.64
Overland	20,818	3,008	33.34	32,512	71,717	71,717	14,668	14.66
Piedmont	16,900	3,906	51.39	29,558	14,911	56,392	567,456	56.74
Southwest	13,895	1,493	40.15	13,134	13,413	853,815	39,446	39.44
Southwest	10,813	1,395	40.81	11,546	5,580	14,734	10,523	10.52
Texas Eastern	15,819	2,858	47.07	39,990	8,164	78,075	327,406	36.76
West Coast	14,513	2,542	40.35	7,190	3,027	3,397	358,893	49.95
HAWAIIAN								
Honolulu	31,841	4,838	39.50	7,150	136,718	593,701	33,518	33.51
Ten Pacific	14,713	7,762	49.08	8,658	30,446	748,112	49,496	49.49
CARGO LINES								
American-South American						5,846,768	2,043,190	1.81
Boeing								
Boeing				32,075	4,414,055	4,445,071	85.68	85.68
HELICOPTER								
New York Airways	3,389	50	71.43	1,073	1,204	478	3,349	54.80
Los Angeles Airways	1,587	07	25.12	10,580	3,894	19,731	19,731	19.73
Helicopters Air Service				6,957		6,957	6,957	61.79

Compiled by AVIATION WEEK from airline reports to Civil Aeronautics Board

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of the most powerful large liquid-propellant rocket engines in the Western World, Rocketdyne is also designing, building, and testing many other types and sizes. For the future, it is carrying on research for even more powerful and startling rocket engines.

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North American Asks Congress For Help in Fight for Low Fares

Washington—North American Airlines Group pleaded for congressional support in its fight to govern low-cost transportation "in between" before the House Commerce Subcommittee on Aviation, headed by Rep. Charles Stenholm (D-Ok.).

James McInerney, co-chairman of the subcommittee, declared that a thorough congressional investigation and action is urgently needed to save the but at existing low-cost "in-between" competition from the low-cost airlines. The 12 bag airlines, now controlling 90% of the total business are determined to wipe out the only surviving competitive option, subsidizing low-cost domestic and Mexican air travel for the public.

Other witnesses in brief, in the subcommittee continued its study of civil aviation were:

• L. C. Burrell, vice president, TWA; Tiger Line, who predicted legislation to eliminate Civil Aeronautics Board's regulations authority which makes it possible for the Board to punish airlines for operation without the requirement for a certificate of public convenience and necessity.

• K. McInerney, executive vice president, Air Line Pilot Assn., who urged that contract carriers be regulated in the same degree as scheduled lines and legal establishment of its independent air carrier board.

McInerney also asked CAB authority to require civil penalties for the flag of airlines scheduling requirements for well over two years without effect enforcement of scheduled airline being taken by the Board," he said.

McInerney declared that pilots, crew salaries, airline management and the public are exposed to serious danger as at flight.

Burrell told the committee that if legislation were passed removing the Board's exemption authority, "We would have a serious problem in the event of an abrupt attack without an act of Congress."

He pointed out that both the all-cargo and local service airline markets got their start through the carrier's efforts.

McInerney maintained that "If Congress makes certain that competition is allowed to survive, get age as airlines should be able to even the U.S. in their home for 378 and its to Europe in about five hours for \$100."

Two subcommittee members—Rep. Harlan and Rep. John Bell Williams (D-Miss.)—approved North American Airlines' position of low-cost transport but expressed concern at its demand of CAB and the requirements

of the 1938 Civil Aeronautics Act. Williams commented on the "in-between" "Whether the North American Airlines Group has operated legally or illegally, I think that let of facts... is a good indication that you have made a very direct contribution to civil aviation in this country."

"That in itself does not necessarily settle... the Board is granting over, then you are asking. However, I think we are entitled to some consideration as that settled."

Parsons, Civil Aeronautics Board and Air Transport Assn. (ATA) Jan. 23, 1964, Commerce Department and giving and all recent law Super-Congressional in April. The Veterans will require Congressional on the subject. Parsons' Motion, and the Super-Congressional will be between Parsons and New York and the Mexico-Russia Madrid route.

London Will Construct Elevated Air Terminal

London—W&A is scheduled to begin work this month on a downtown air terminal that will replace an old one and provide a new terminal. The new terminal will be located on the western edge of the city. Present plans call for its completion by 1968.

The 75,000-sq-ft, 1,000 ft. long terminal will be supported by 38 steel columns and located on a strong structure between the subway tracks, administrative offices, shops, a terminal parking lot and other facilities will be included in the development.

Since British European Airways' interest in the existing Waterloo Air Terminal will expire next year, a temporary terminal will be opened on the platform.

London Transport, the municipal transportation company, will be turned over to Air Terminal Ltd., an organization formed for the purpose by BEA, British European Airways Corp. and Air Lines.

Shortlines

• Atlanta, the Indian airline, will start the first direct service between Venice and London in April with Convair equipment.

• British Overseas Airways Corp. says that its traffic between New York and Bermuda will increase in January, compared with January, 1955. The British airline carried 822 passengers last month and 218 in the previous January. Consequently, the carrier operates a daily Super-

Constellation tourist service and three Viscounts first class flights a week to Bermuda.

• Colombia's government is negotiating with private airlines for helicopter service on three regular routes. The transportation bureau of the country presently prohibits all helicopter operations, but it also governs transportation in a vast territory as in the very old land transport.

• Continental Air Lines has taken up its options on three Viscount 510/540 transports, leaving its total order to 17 and total Viscount sales to 277. Continental is talking to others on another five Viscounts.

• Cebu, the Cebu airline, has bought four Viscounts for delivery in 1967 and eight Super-Congressional in April. The Viscounts will replace Constellation on the Cebu-Manila-Madrid route, and the Super-Congressional will be between Manila and New York and the Mexico-Russia Madrid route.

• Delta Air Lines and Southern Airways started a radio and newspaper campaign this month to encourage the U.S. to provide air service between Jakarta and Hong Kong via Singapore and Bangkok.

• Garuda Indonesia Airways plans to expand operations in the Far East and will buy several jet transport transports in the United States and Great Britain. The most new jets for the Indonesian airline is reported to be service between Jakarta and Hong Kong via Singapore and Bangkok.

• Hong Kong Government has issued a travel license to Macao Air Transport, Hong Kong Airways, Ltd., and Cathay Pacific Airways, Ltd. Macao Air Transport is licensed for a FBY service to Macao, and Hong Kong Airways Ltd. DC-4 service to Jakarta. Cathay Pacific is authorized to operate between Hong Kong and Taipei, Manila, Calcutta, Bangkok, and Singapore.

• Loma, the Costa Rican affiliate of Pan American World Airways, has started a weekly service between Panama and Puerto Rico with Convair 440 equipment.

• Pan American World Airways flew 687,020,000 passenger-miles in the fourth quarter of 1955, compared with 563,245,000 passenger-miles for the same quarter of 1954.

• TWA World Airlines is distributing a Guide to Hotel Facilities for Business Meetings and Conventions to various organizations to help them plan their meetings and conferences.

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AVIATION WEEK, February 10, 2004

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